Biota Environmental Sciences

New Morning Level 1 and Targeted Terrestrial Fauna Survey

Prepared for Western Areas NL

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New Morning Fauna Survey

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1.0 Summary

1.1 Background and Scope

Western Areas NL (Western Areas) proposes to develop the New Morning deposit, located 400 km east of Perth, in Western Australia. Infrastructure will comprise an open cut mine with an associated rock waste dump, leach pad, a haul road diversion and leach solution pipeline. Together, these components comprise the 'study area', encompassing 325.5 ha. It is anticipated that the future development of New Morning may be formally assessed under the State *Environmental Protection Act 1986.*

The purpose of this study was to conduct a Level 1 and targeted survey for key conservation significant fauna potentially occurring within the study area.

The key elements of the scope comprised:

- preparation of a desktop assessment including database and literature searches, in order to consolidate all available and relevant existing data;
- assessment of the likelihood of occurrence of fauna of conservation significance, or their preferred habitat, within the study area in the preliminary desktop assessment (particularly with respect to Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Malleefowl (*Leipoa ocellata*) and Chuditch (*Dasyurus geoffroii*);
- assessment and description of any habitats deemed significant for supporting known or potential populations of fauna of conservation significance; and
- completion of a single phase, targeted terrestrial vertebrate and Short-range Endemic (SRE) fauna survey within the study area to meet current Environmental Protection Authority (EPA) guidance.

1.2 Methodology

The survey was conducted over a 13-day period from August 27th to September 8th 2018, in accordance with the relevant EPA Technical Guidance and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Sampling effort included:

- Foot traverses encompassing the entire study area to identify Carnaby's Black-Cockatoo breeding 'habitat trees' and secondary evidence of Carnaby's Black-Cockatoo foraging and opportunistic records;
- Foot traverses encompassing the entire study area to identify Malleefowl nesting activity, occurrence and secondary sign;
- Targeted Elliott and Cage trapping at three systematic trapping sites and deployment of six remote cameras to determine occurrence of Chuditch;
- A total of 30 person hours dedicated to SRE searches at 11 sites within the study area; and
- A subsequent detailed survey of the identified potential nesting hollows conducted from January 6 to 19 2019 (Johnstone and Kirkby 2019), with results from that survey presented in part in this report.

1.3 Results

During the field survey, evidence of Chuditch, Carnaby's Black-Cockatoo and Malleefowl was recorded within the study area. No other vertebrates of conservation significance were recorded, however database searches returned 21 State and Commonwealth listed conservation significant fauna species that have the potential to occur within the study area. Based on habitat preferences and occurrence of records in proximity to the study area, 11 species of conservation significance have either been recorded, are likely to occur, or may potentially occur within the study area.

A total of 1,445 Carnaby's Black-Cockatoo breeding habitat trees were recorded in the study area during the survey. Of these, 186 trees were found to have potentially suitable nesting hollows, representing 12.9% of all breeding habitat trees within the study area. A subsequent and more detailed survey of the identified potential nesting hollows revealed all but one hollow to be unsuitable for Carnaby's Black-Cockatoo nesting due to them being "too small and shallow, blocked with debris, burnt off stumps or with small jagged floors" (Johnstone and Kirkby 2019).

The loss of mature, hollow-bearing trees necessary for breeding and the loss of existing foraging habitat constitute the main potential impacts of mine development on Carnaby's Black-Cockatoo. Where possible, mitigation and management actions should prioritise impact avoidance and incorporate mine and infrastructure design to minimise clearing of cockatoo habitat.

Six inactive Malleefowl nesting mounds were identified within the study area and Malleefowl tracks were also recorded at a single location. All secondary evidence of Malleefowl detected during the survey was recorded from *Eucalyptus* woodland habitat. In addition, an adult male Chuditch was captured within the study area, with scats recorded at two additional locations. Construction of the proposed mine and infrastructure is unlikely to affect the Malleefowl or Chuditch population in the locality, although it has the potential to cause localised mortality through land clearing.

Four species of mygalomorph spiders were identified from the nine successfully sequenced specimens. Of these, two species (Idiopidae – *Idiosoma* IA_I121 and Nemesiidae – *Chenistonia* NCF_N68) had previously been recorded at Forrestania. There were two species (Actinopodidae – *Missulena* AYA_I6 and Idiopidae – *Idiosoma* IA_I121) for which there are no previous records; these may represent previously uncollected species. All four taxa can be classified as potential SREs.

One species of millipede belonging to the family Polydesmidae was collected from three sites during the survey. This was identified by the WA Museum as *Antichiropus exclamatus,* which has a widespread distribution and is not considered an SRE.

Three fauna habitats were identified in the study area using on-ground habitat assessment in combination with vegetation mapping:

- *Eucalyptus* woodland on clay-loam plain;
- Mallee woodland and shrubland on sand-loam plain or stony rise; and
- Heathland on sandplain.

These habitats are common within the locality and occur contiguously with the same habitat types outside of the study area. Therefore, although the conservation significant fauna within the development footprint may be impacted by implementation of the mine and infrastructure, it is not likely to affect the persistence of conservation significant species in the locality. Similarly, the overall fauna assemblage within the study area would not be unique and would also occur outside of the study area.

1.4 Management Recommendations

Based on the potential threatening processes that may affect the three conservation significant vertebrate species recorded in the study area, and with consideration to the proposed development, the following management recommendations should be considered:

1. If project timing requires clearing to be completed during the Malleefowl or Carnaby's Black-Cockatoo peak breeding season (August to late January and July to November, respectively), then targeted surveys should be conducted prior to commencing.
2. Revision and implementation of the feral animal control management plan to mitigate the risk of predation (cats and foxes) through a continued feral animal-control baiting programme within Western Areas' tenements, specifically the New Morning tenement.

3. Revision and implementation of the fire management plan in relation to the proposed development. This may focus on minimising the spread of fires on a local scale and promote patchier burns if fire does occur. Particular attention should be given to Eucalypt woodland in regards to Carnaby's Black-Cockatoo and to Mallee woodland and shrubland in regards to Malleefowl.
4. In cases where threatened fauna are recorded, it is advisable to refer proposals to the Commonwealth Department of the Environment and Energy (DoEE) to determine if the likely impacts are considered significant.

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2.0 Introduction

2.1 Project Background

Western Areas NL (Western Areas) operates the Forrestania Nickel Project, located 400 km east of Perth, in Western Australia. In addition to its existing operations, Western Areas proposes to develop the New Morning deposit, which will comprise construction of an open cut mine with an associated rock waste dump and leach pad. Additionally, a diversion of an existing 6.5 km section of haul road and construction of a 6 km pregnant liquor (leach solution) pipeline will be required. Together, these components comprise the 'study area', encompassing 325.5 ha (Figure 2.1). It is anticipated that the future development of New Morning will be formally assessed under the State *Environmental Protection Act 1986.*

2.2 Scope and Objectives of this Study

The purpose of this study was to gather information to enhance the level of knowledge the New Morning Project study area at the locality scale, by conducting a desktop assessment and then undertaking a Level 1 and targeted terrestrial fauna survey for key conservation significant fauna. The field survey and associated reporting have been completed to a sufficient standard to inform and support the environmental impact assessment (EIA) of the New Morning Project in accordance with EPA and EPBC Guidelines.

The key elements of the scope comprised:

- preparation of a desktop assessment including database and literature searches, in order to consolidate all available and relevant existing data;
- assessment of the likelihood of occurrence of fauna of conservation significance, or their preferred habitat, within the study area in the preliminary desktop assessment (particularly with respect to Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Malleefowl (*Leipoa ocellata*) and Chuditch (*Dasyurus geoffroii*);
- assessment and description of any habitats deemed significant for supporting known or potential populations of fauna of conservation significance; and
- completion of a single phase, targeted terrestrial vertebrate and Short-range Endemic (SRE) fauna survey within the study area to meet current EPA guidance.

2.3 Overview of Targeted Taxa

2.3.1 Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris)*

Carnaby's Black-Cockatoo is listed as a Schedule 2 (Vulnerable) species under the State *Biodiversity Conservation Act 2016*[1] and Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The primary threat to the species is loss of breeding and foraging habitat through activities such as logging and deforestation for agriculture.

Carnaby's Black-Cockatoo is endemic to the southwest of Western Australia, occurring from Kalbarri to Esperance, with documented breeding areas overlapping the study area (Johnstone and Storr 1998, DSEWPaC 2012a). The species requires tree hollows with suitable dimensions for nesting, which typically occur in larger trees over 200 years old (DSEWPaC 2012a). Breeding habitat trees are defined in the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPaC 2012a) as "any trees with DBH equal to or greater than 500 mm, or Wandoo

[1] The 'Specially protected fauna notice' (September 2018) was issued under the *Wildlife Conservation Act 1950*, which was repealed on 1st January 2019, however an updated gazetted notice has not yet been issued under the *Biodiversity Conservation Act 2016*.

(*Eucalyptus wandoo*) and Salmon Gum (*E. salmonophloia*) trees with DBH equal to or greater than 300 mm" (DSEWPaC 2012a).

During the peak breeding season between July and November, the population has historically been concentrated in the Wheatbelt region (Johnstone and Storr 1998, Saunders et al. 2014b). However, in the last 10-30 years their breeding range has expanded further south and west towards the Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) forests of the Darling Scarp, and Tuart (*E. gomphocephala*) forests of the Swan Coastal Plain (Johnstone et al. 2010). Outside of the breeding season, they also frequent coastal areas where they forage in large flocks (Saunders et al. 2011), feeding on the seeds of *Banksia*, *Eucalyptus* species such as Jarrah, Marri and Karri (*E. diversicolor*), and Radiata Pine *(Pinus radiata)*.

In the Wheatbelt, they nest primarily in Salmon Gum and Wandoo trees, but are also known to utilise Tuart, Marri, Red Morrel (*E. longicornis*) and York Gum (*E. loxophleba*) (Johnstone and Storr 1998). Long-term studies have shown that Carnaby's Black-Cockatoos utilise hollows ranging from 10 – 65 cm in diameter (average 26 cm) and approximately 130 cm deep (Saunders et al. 2014a, 2014b). The Carnaby's Black-Cockatoo population in the Forrestania region is considered to be part of the Wheatbelt population.

2.3.2 Malleefowl (*Leipoa ocellata*)

The Malleefowl is listed as a Schedule 3 (Vulnerable) species under the State *Biodiversity Conservation Act 2016* and Vulnerable under the Commonwealth *EPBC Act 1999*. Malleefowl were originally common and widespread in the semi-arid zone. The species is now uncommon to rare and patchily distributed in Western Australia due to the effects of habitat clearing and fox predation (Johnstone and Storr 1998).

In Western Australia, Malleefowl occur predominantly to the south and west of a line extending from north of Carnarvon to Eucla in the south-east of Western Australia (Johnstone and Storr 1998, Barrett et al. 2003). In this region, Malleefowl inhabit mostly scrubs and thickets of mallee eucalypts (*Eucalyptus* spp.), Boree (*Melaleuca lanceolata*), Bowgada (*Acacia linophylla*) and other dense shrublands (Johnstone and Storr 1998). Breeding habitat is characterised by light soil and abundant leaf litter, which is used in the construction of nesting mounds (Marchant and Higgins 1993).

Malleefowl are a moderately long-lived bird, with an average life span of approximately 15 years (Benshemesh 2007). Malleefowl start breeding at 3 to 4 years old. They usually breed in monogamous pairs (Marchant and Higgins 1993), with breeding occurring every year except during drought conditions (Benshemesh 2008). Although a pair of Malleefowl may have many nest mounds in the area over which they range, they typically use only one mound each year, breeding from August to late January. The same nest mound may be used for several years before re-activating a different mound, or they may use a different mound each year, and mounds may be reactivated after substantial periods of time. Malleefowl generally prefer to renovate old mounds rather than build new ones (Priddel and Wheeler 2003).

2.3.3 Western Quoll, Chuditch (*Dasyurus geoffroii*)

The Chuditch is listed as a Schedule 3 (Vulnerable) species under the State *Biodiversity Conservation Act 2016* and Vulnerable under the Commonwealth *EPBC Act 1999*. The species faces a number of threats including predation and competition with the Red Fox and the Cat, altered fire regimes, direct mortality as a result of road trauma, habitat loss and degradation (DEC 2012). The species formerly ranged across nearly 70% of the continent, occurring in every mainland State and Territory (DEC 2012). Most contemporary records of this species are from areas of continuous forest in south-west Western Australia, and only from Wheatbelt areas where suitable fragments of habitat remain (van Dyck and Strahan 2008, DEC 2012).

The Chuditch is a seasonal breeder, with mating occurring in late April to early July (van Dyck and Strahan 2008). It utilises hollow logs and burrows as dens or refuge in *Eucalyptus* forests, dry woodlands and mallee shrublands (van Dyck and Strahan 2008).

2.3.4 Short Range Endemic Invertebrates

SRE fauna comprise taxa that display naturally small distributions of less than 10,000 km^2 (Harvey 2002). These invertebrates often possess similar ecological and life-history characteristics and are in part characterised by low fecundity, slow growth and poor dispersal capabilities (Harvey 2002). Examples exist from a range of groups including freshwater snails (Ponder and Colgan 2002), land snails (Johnson et al. 2004), and mygalomorph spiders (Main et al. 2000).

In addition, SRE invertebrates are often confined to disjunct 'refugial' habitats, having persisted from a time when moist conditions were more evenly distributed throughout the Australian landscape (Harvey 2002). Their predisposition to being restricted at small spatial scales means SRE fauna are at greater risk of population extinctions than more widely distributed taxa (Harvey 2002). As a result, the potential presence of SRE taxa in development areas represents a relevant factor for proposals being assessed by the EPA (see EPA 2016).

In recognition of their small distributions and ongoing threatening processes, numerous SRE taxa are listed as Specially Protected fauna under the WA *Biodiversity Conservation Act 2016*. On land, mygalomorph spiders, millipedes and land snail taxa dominate this listing (EPA 2016). Additionally, the Department of Biodiversity Conservation and Attractions (DBCA) lists some SRE taxa as Priority species.

Figure 2.1: Study area location map.

3.0 Methodology

3.1 Desktop Assessment

The aim of the desktop assessment was to compile and review information relevant to the study area to identify known features of conservation significance. This review considered regional information and previous biological surveys completed in the locality (Section 3.1.1) and the results of database searches (Section 3.1.2).

3.1.1 Literature Review

The literature review comprised:

- a summary of the Interim Bioregionalisation for Australia (IBRA) region and subregion (Beecham and Danks 2001, Cowan et al. 2001); and
- a review of relevant biological surveys completed previously in the locality.

The results of the literature review are summarised in Section 5.1.

3.1.2 Database Searches

The following databases were searched as part of the desktop assessment:

1. NatureMap (https://naturemap.dpaw.wa.gov.au) is a joint project of the DBCA and the Western Australian Museum (WAM). This database represents the most comprehensive source of information on the distribution of Western Australia's fauna, comprising records from the WA Threatened Fauna Database, Fauna Survey Returns Database (managed by the DBCA), the WAM Specimen Database, and the BirdLife Australia Atlas of Australian Birds. NatureMap was searched primarily to identify records of conservation significant fauna known from the locality of the study area.
2. The BirdLife Australia Birdata database (http://www.birdata.birdlife.org.au) was also searched for any additional records of Carnaby's Black-Cockatoos, as the Atlas of Australian Birds is only uploaded to NatureMap intermittently.
3. The Commonwealth EPBC Act Protected Matters Search Tool was searched to identify Federally listed fauna species and any other matters of national environmental significance (MNES) that are known to or may occur in the locality.
4. Biota's internal database from the locality.

All searches were centred on the coordinate 32.4547°S, 119.6897°E, with search results requested from a 40 km radius. Results from the NatureMap and EPBC Act Protected Matters Search Tool are provided in Appendix 1.

3.1.3 Assessment of Likelihood of Occurrence in the Study Area

In order to determine which species of conservation significance have the potential to occur in the study area, the results of the database searches and previous surveys in the locality were examined while considering the known habitat preferences and distributions of the species identified. Habitats were defined according to vegetation units, landforms apparent on aerial imagery, and taking into account existing information regarding the environment.

For each species of conservation significance potentially occurring in the study area, a set of rankings and criteria were applied to assess their likelihood of occurrence (Table 3.1). The term 'close proximity' is defined as being within 20 km of the study area, while the broader 'locality' comprises the area up to 40 km from the study area.

Table 3.1: Criteria used to assign the likelihood of occurrence of a species within the study area.

Rank	Criteria
Recorded	1. The species has been previously recorded in the study area.
Likely to occur	1. There are existing records of the species in close proximity to the study area (within 20 km); and • the species is strongly linked to a specific habitat, which is present in the study area; or • the species has more general habitat preferences, and suitable habitat is present.
May potentially occur	1. There are existing records of the species from the locality (within 40 km), however • the species is strongly linked to a specific habitat, of which only a small amount is present in the study area; or • the species has more general habitat preferences, but only some suitable habitat is present. 2. There is suitable habitat in the study area, but the species is recorded infrequently in the locality.
Unlikely to occur	1. The species is linked to a specific habitat, which is absent from the study area; or 2. Suitable habitat is present, however there are no existing records of the species from the locality despite reasonable previous search effort in suitable habitat; or 3. There is some suitable habitat in the study area, however the species is very infrequently recorded in the locality or the only records are historical (>40 years ago).
Would not occur	1. The species is strongly linked to a specific habitat, which is absent from the study area; or 2. The species' range is very restricted and does not include the study area; or 3. The species is not considered extant in the locality.

3.1.4 Threatened Fauna Statutory Framework

Native fauna species that are rare, threatened with extinction, or have high conservation value, are specially protected by law under either or both of the State *Biodiversity Conservation Act 2016* and the Commonwealth EPBC Act. The DBCA also maintains a list of Priority species that are considered of conservation significance but have not been assigned statutory protection under the *Biodiversity Conservation Act 2016*. Appendix 2 details the categories of conservation significance recognised under these frameworks.

3.2 Survey Timing and Weather

3.2.1 Survey Team and Timing

The field survey was carried out over a period of 13 days, from the 27th August to 8th September 2018 by three Biota zoologists; Michael Greenham, David Keirle and Brandon King. The timing of the survey overlapped the start of the breeding period for Carnaby's Black-Cockatoo, taking place at the start of spring. The survey was completed under "Licence to Take Fauna for Scientific Purposes" No. 08-002700-2 issued to Dan Kamien.

3.2.2 Daily Weather Observations

Over 26 mm of rainfall was recorded during the survey and temperatures were mild, ranging from a minimum of 1.0°C to a maximum of 21.8°C (Table 3.2). Weather data were obtained from the Bureau of Meteorology weather station at Hyden (No. 010568), located approximately 76 km east of the study area.

Table 3.2: Weather at Hyden during the survey period.

	27/8	28/8	29/8	30/8	31/8	1/9	2/9	3/9	4/9	5/9	6/9	7/9	8/9	Mean / Total
Maximum temperature (°C)	21.1	15.4	13.6	14.5	13.6	16.0	20.0	21.8	18.7	14.6	15.6	18.0	24.5	**17.5**
Minimum temperature (°C)	3.5	5.7	5.5	5.9	3.1	8.9	4.0	2.0	4.9	6.5	1.0	1.2	4.5	**4.4**
Rainfall (mm)	0.0	0.0	16.6	7.6	0.5	0.0	0.0	0.0	0.0	1.6	0.0	0.0	0.0	**26.3**

3.2.3 Climatological Data

Long-term climatological data (1970 to 2018) were also obtained from the Hyden weather station (No. 010568). Figure 3.1 illustrates the average monthly minimum and maximum temperatures and rainfall for the year preceding the survey as compared with the long-term averages. Maximum and minimum temperatures in the year preceding the survey were consistent with long-term averages. Lower than average monthly rainfall was received during March to June 2018, but higher than average rainfall was recorded in the two months preceding the survey (July and August 2018).

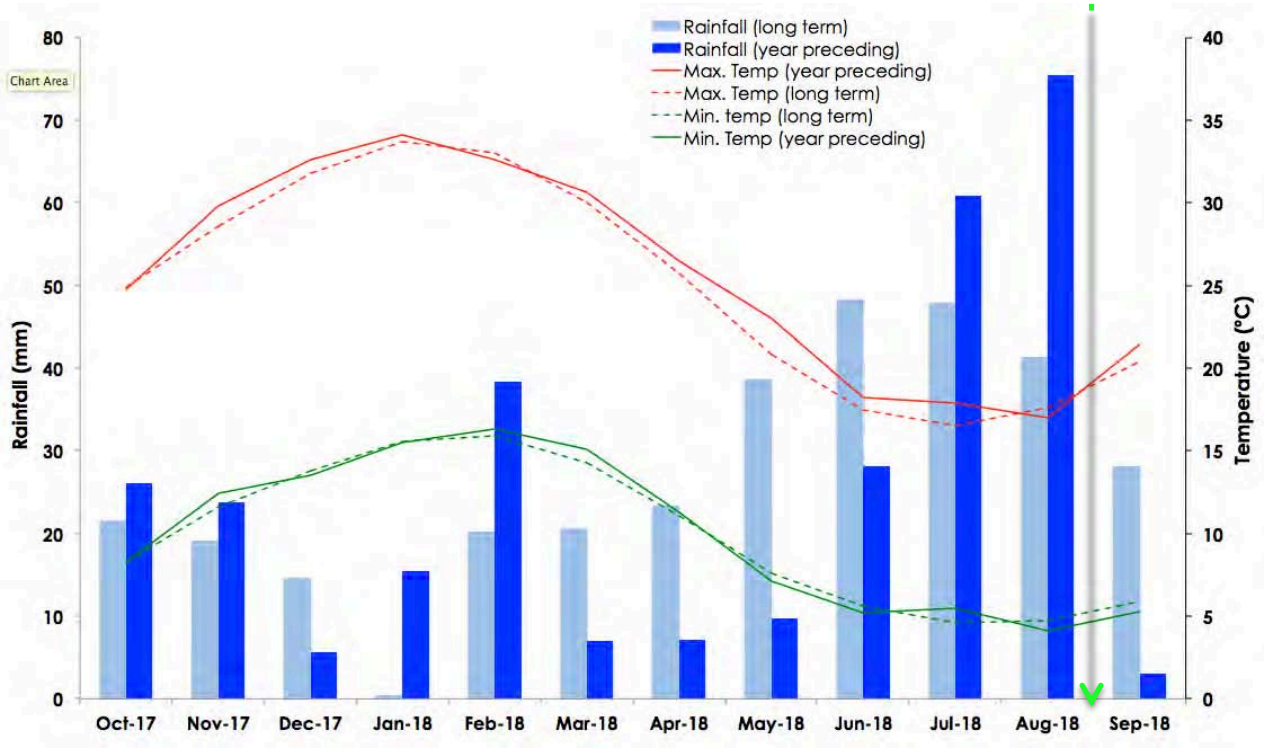

Figure 3.1: Climate and weather graph depicting long-term averages and 2018 data.
(Long-term data 1970-2018; green arrow indicates survey timing).

3.3 Fauna Sampling

3.3.1 Carnaby's Black-Cockatoo

The survey was conducted via foot traverses (Figure 3.2) with the aim of identifying breeding 'habitat trees' as defined in the Commonwealth referral guidelines (DSEWPaC 2012a). Although the guidelines refer to those trees with a diameter at breast height (DBH) exceeding 50 cm, or exceeding 30 cm in the case of Wandoo (*Eucalyptus wandoo*) and Salmon Gum (*E. salmonophloia*), they also state that "*In a woodland stand with trees of suitable diameter at breast height, all trees of all ages and size are potentially important for maintaining breeding in the long term*", a statement supported by Ron Johnstone of the WA Museum (pers. comm. 2018). As a result, all tree species of DBH greater than 30 cm were identified during the survey.

Hollows suitable for nesting were conservatively defined as having a diameter of 10 cm or greater, based on minimum diameters previously recorded for breeding Carnaby's Black-Cockatoo ((Johnstone and Storr 1998, Saunders et al. 2014a, 2014b). Hollows were assessed from ground level using binoculars.

The following parameters were recorded for each breeding habitat tree:

- DBH and tree height;
- the number of hollows observed and their height above the ground;
- the diameter of each hollow; and

- signs of Carnaby's Black-Cockatoo use (including wear around hollows; nut chews, scarring, scratch marks on trunks and branches, secondary evidence of feeding sites and moulted feathers).

Secondary evidence of Carnaby's Black-Cockatoo foraging and opportunistic records were also recorded during the course of the field survey. These signs include evidence of feeding sites (particularly fallen chewed fruit) and moulted feathers.

Although the updated draft black-cockatoo referral guidelines (DoEE 2017) have not been finalised, data were collected in a manner relevant to the recently developed 'foraging habitat scoring tool' (DoEE 2017).

A subsequent and more detailed survey of the identified potential nesting hollows was conducted from January 6 to 19 2019 (Johnstone and Kirkby 2019). At the request of Western Areas these results are in part presented in this report, in the context of the August/September survey conducted by Biota.

3.3.2 Malleefowl

The Malleefowl survey was also conducted via foot traverse (Figure 3.2), conducted concurrently with the Carnaby's Black-Cockatoo survey. The following parameters were recorded:

- GPS location of Malleefowl nesting mounds;
- estimated size and age of nesting mounds;
- evidence of recent nest utilisation; and
- secondary sign of Malleefowl or direct sightings.

3.3.3 Chuditch

Targeted trapping for Chuditch consisted of a combination of systematic fauna sampling and targeted searches. Systematic sampling was centred on three main trapping sites; two of these consisted of 30 large Elliott traps and four cage traps, while the third consisted of 20 large Elliott traps and six cage traps (Table 3.3). Traps were baited with a mixture of peanut butter, rolled oats and bacon. Each trapping site was open for seven consecutive nights, translating to a total of 658 trap nights (Table 3.3).

Table 3.3: Trapping site locations and effort.

Site Name	Easting (mE)	Northing (mN)	Date Opened	Date Closed	Number of Traps		Nights Open	Trap Nights
					Elliott	Cage		
NME01	750764	6405979	27/8/18	03/09/18	30	4	7	238
NME02	751356	6406025	28/8/18	04/09/18	30	4	7	238
NME03	751763	6405884	28/8/18	04/09/18	20	6	7	182
				Total large Elliott trapping effort				**560**
				Total cage trapping effort				**98**
				Total trapping effort				**658**

Six remote infrared motion cameras were also deployed within the study area (Figure 3.2). Bait was placed on the ground in order to attract animals to within the camera's field of view. Cameras were deployed for seven or eight nights, comprising a combined total effort of 47 active camera nights (Table 3.4).

Table 3.4: Remote camera locations and effort.

Site Name	Easting (mE)	Northing (mN)	Date Opened	Date Closed	Nights Active
NMM01	751791	6406430	28/08/18	05/09/18	8
NMM02	753736	6403634	28/08/18	05/09/18	8
NMM03	753713	6405996	28/08/18	05/09/18	8
NMM04	752691	6407874	28/08/18	05/09/18	8
NMM05	751500	6404797	28/08/18	05/09/18	8
NMM06	751968	6406492	31/08/18	07/09/18	7
				Total Active Nights	**47**

During routine trap checks and foot traverses, the study area was also examined for secondary evidence of Chuditch; specifically, tracks and scats.

3.3.4 Short-Range Endemic Invertebrates

SRE invertebrates are taxonomic groups of invertebrates that exhibit naturally small distributions, (less than 10, 000 km^2, as per Harvey 2002). Certain groups of invertebrates are pre-disposed to short-range endemism through certain life history traits such as poor dispersal capabilities, confinement to disjunct habitats, slow reproduction and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the Importance of short-range endemism to the conservation of biodiversity (EPA 2009), the assessment of such invertebrate taxa is a potentially important component of impact assessment. The taxomomic groups targeted included:

- mygalomorph spiders (Mygalomorphae);
- millipedes (Diplopoda); and
- terrestrial snails (Pulmonata).

In total, almost 30 person hours were dedicated to SRE fauna searches (Table 3.5). Search sites were located where SRE species most frequently occur (e.g. habitat with suitable soil profile, rock piles and drainage depressions). A total of 11 SRE sites were sampled (Table 3.5 and Figure 3.2).

Table 3.5: SRE site location and search effort.

Site	Easting (mE)	Northing (mN)	Personnel	Minutes Searched	Effort (minutes)
NMMSRE01	751078	6406045	3	114	342
NMMSRE02	751400	6406024	3	27	81
NMMSRE03	751984	6405956	3	42	126
NMMSRE04	Not sampled	–	–	–	
NMMSRE05	753777	6403315	3	66	198
NMMSRE06	753266	6407113	3	61	183
NMMSRE07	752070	6406286	3	35	105
NMMSRE08	751896	6405431	3	101	303
NMMSRE09	751486	6404651	3	77	231
NMMSRE10	751568	6405470	3	43	129
NMMSRE11	750761	6406329	3	26	78
NMMSREOPP-01	751332	6405670	3	–	–
				Total Minutes	**1,776**

Mygalomorph spiders were targeted by visually locating burrows, and then excavating them with the aim of collecting individuals to be preserved in 70% ethanol for morphological description. Two legs were removed and placed in 100% ethanol for molecular analysis.

Millipedes were searched for under leaf litter and logs. Aestivating land snails were targeted by digging in drainage gullies and at the base of trees and shrubs.

3.3.4.1 Determining SRE Status

Due to the difficulties inherent in assessing SRE status of invertebrates (see Section 3.4), a systematic approach has been adopted in an attempt to provide a clear and consistent method.

The SRE status of species is based on their geographic distributions, which are described by two summary statistics. The first is the 'maximum spanning distance', which is the maximum linear distance between two records. The second statistic is the 'minimum spanning area', which is the area of the smallest polygon that can be drawn around all of the records.

The minimum spanning area can be used as a means for objectively establishing SRE status by comparison against the 10,000 km^2 criterion established by Harvey (2002). Table 3.6 details the criteria used to determine the SRE status of putative species for the purposes of this report.

Table 3.6: Criteria used to determine SRE status.

SRE Status	Defining Criteria
Known SRE	• Species, morphotype or genetic type has a documented distribution of <10,000 km^2. • Species, morphotype or genetic type is well collected with numerous specimens typed and habitat preference understood.
Potential SRE	• Species, morphotype or genetic type has a documented distribution of <10,000 km^2 but is poorly sampled. • Specimen may not be formally described or assigned to a morphotype / genetic type. • Short-range endemism may be common in genus or family. • May have been collected from restricted, refugia or isolated habitats.
Unlikely to be an SRE	• Species, morphotype or genetic type has a documented distribution of <10,000 km^2 but is poorly sampled. • Specimen may not be formally described or assigned to a morphotype / genetic type. • Short-range endemism is not common in genus or family. • Taxon was not collected from restricted, refugia or isolated habitats. • Few other individuals of the taxon collected, but records are separated by long distances (>100 km).
Not an SRE	• Specimen formally described or assigned to a morphotype / genetic type. • Species, morphotype or genetic type has a documented distribution of >10,000 km^2.
Undetermined	• Taxa where there is insufficient taxonomic framework available to provide any informed comment on the species-level distribution of the fauna or, therefore, the risk of small-scale spatial restrictions.

3.3.5 Other Fauna of Conservation Significance

Any other conservation significant species opportunistically noted during the survey were also documented. This included secondary sign such as tracks, scats, diggings, burrows, scratchings, hollows or nests. The species currently assessed as likely to occur in the study area are discussed in Section 5.2.

3.4 Study Limitations and Caveats

The findings of this study should be considered in the context of the following limitations:

1. The Carnaby's Black-Cockatoo component conducted by Biota did not include climbing trees to conduct close physical examinations of identified tree hollows, given the large number of trees to be assessed. Evidence of breeding was restricted to wear around hollows evident with binoculars. As such, tree hollows recorded were not definitively confirmed as being suitable for, or currently being utilised by, Carnaby's Black-Cockatoo.
2. Any hollow with an entrance diameter of 10 cm or greater, and with an estimated depth of 35 cm or greater was conservatively assessed as a possible Carnaby's Black-Cockatoo nesting hollow. A definitive assessment of utilisation would require climbing each tree and assessing each such entrance to ensure that it did represent a hollow of suitable depth and width for

breeding. This was completed during a subsequent and more detailed survey conducted by Johnstone and Kirkby (2019).

3. Field zoologists with limited botanical expertise conducted species identifications of each breeding habitat tree, so all trees with a DBH above 300 mm were included as a precautionary measure. Identifications were verified following the survey, using photographs in combination with vegetation association data provided by Botanica Consulting.
4. With the exception of Salmon Gum (*Eucalyptus salmonophloia*), none of the tree species recorded in the study area are known to support Carnaby's Black-Cockatoo breeding and are not mentioned in the referral guidelines (DSEWPaC 2012a).
5. Cool and wet weather conditions during much of the survey period may have resulted in lower than usual activity levels for some fauna species, particularly reptiles and the Chuditch.
6. For SRE invertebrates, there are often inconsistencies in identification methods for specimens identified in the desktop review. Many species that have been subject to molecular analysis are difficult to compare with those identified solely on morphological characteristics. Some specialists have also maintained separate voucher collections and naming systems from that followed by the WAM and GenBank (an open access molecular sequence database). These inconsistencies may cause a single taxon to be incorrectly recognised as two or more species.
7. SRE fauna sampling effort was not apportioned evenly across the study area, as parts were inaccessible in the available timeframe. However, SRE fauna searches and sampling were conducted in habitats considered to be representative of all main habitat units present within the study area.
8. Terrestrial invertebrate sampling was targeted at a small number of specific groups that are known to potentially contain SRE taxa.
9. There is only a limited taxonomic framework and ecological knowledge for the majority of potential SRE invertebrates (EPA 2009).
10. Sampling difficulties exist for potential SRE taxa. For example, mygalomorph spiders are difficult to locate, and accurate morphological identification requires adult male specimens.
11. The most recent phylogenetic data are presented in this report. However, molecular studies are ongoing for several invertebrate groups, and specimens collected during future surveys in the locality may alter reference data sets. As additional data are incorporated into the DNA barcoding framework, species distributions and SRE status may be revised.

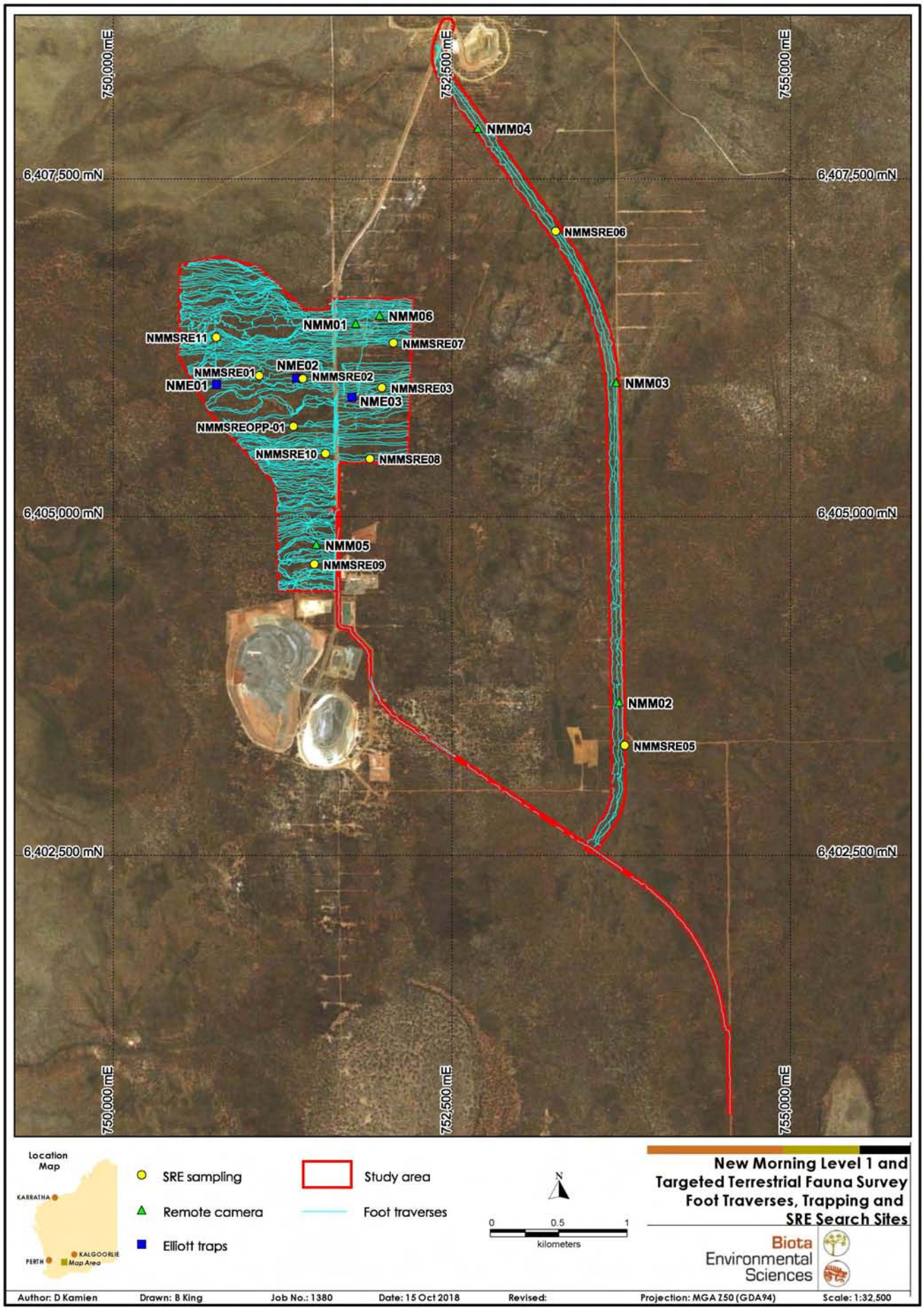

Figure 3.2: Foot traverses and fauna site locations within the study area.

4.0 Regional Context

4.1 IBRA Bioregions and Subregions

The Interim Biogeographic Regionalisation for Australia (IBRA) recognises 89 bioregions and 419 subregions (DSEWPaC 2012b). The study area occurs predominantly in the Southern Cross subregion of the Coolgardie bioregion (292.7 ha). However, 32.8 ha also occurs within the Mallee bioregion, specifically within the Western Mallee subregion. These subregions are characterised as follows:

- **Southern Cross** (Coo2): "comprises 7,041,232 ha of diverse *Eucalyptus* woodlands (*Eucalyptus salmonophloia, E. salubris, E. transcontinentalis, E. longicornis*). It contains salt lakes, low greenstone hills, valley alluvials and broad plains of calcareous earths. The granite basement outcrops at mid-levels in the landscape and supports swards of *Borya constricta*, with stands of *Acacia acuminata* and *Eucalyptus loxophleba*. Upper levels in the landscape are the eroded remnants of a lateritic duricrust yielding yellow sandplains, gravelly sandplains and laterite breakaways. Mallees (*Eucalyptus leptopoda, E. platycorys and E. scyphocalyx*) and scrub-heaths (*Allocasuarina corniculata, Callitris preissii, Melaleuca uncinata* and *Acacia beauverdiana*) occur on these uplands, as well as on sand lunettes associated with playas along the broad valley floors, and sand sheets around the granite outcrops. The scrubs are rich in endemic acacias and Myrtaceae. Annual rainfall is 250-300 mm." (Cowan et al. 2001)
- **Western Mallee** (Mal2): "comprises 4,763,963 ha located at the south-eastern part of Yilgarn Craton. Its landscape is gently undulating, with partially occluded drainage. Mallee over myrtaceous-proteaceous heaths on duplex (sand over clay) soils are common. *Melaleuca* shrublands characterise alluvia, and *Halosarcia* (now *Tecticornia*) low shrublands occur on saline alluvium. A mosaic of mixed eucalypt woodlands and mallee occur on calcareous earth plains and sandplains overlying Eocene limestone strata in the east. Landscape is fragmented with particular surface-types almost completely cleared as wheatfields. Annual rainfall is 250-500 mm." (Beecham and Danks 2001)

4.2 Geology

Eight geological units occur within the study area (mapped at 1:250,000 scale; Geological Survey of Western Australia 1986). These are listed in Table 4.1 and mapped in Figure 4.1

Table 4.1: Geological units of the study area.

Geological Age	Code	Geological Description	Extent within Study Area (ha)
Quaternary	Czg	Remnant sandplain; yellow and white sand containing locally abundant limonite pebbles: derived from Czl.	15.2
	Qe	Colluvium and eluvium; red-brown clay and silt derived from mafic amphibolite.	212.4
Tertiary	Czl	Laterite; limonite cemented duricrust overlying deeply weathered bedrock; minor silcrete	4.5
Archean	Alm	Quartz-rich schist and micaceous quartzite; metamorphosed siltstone and sandstone.	21.9
	Aab	Fine and medium-grained mafic amphibolite and metabasalt.	18.1
	Aup	Serpentinite; derived from peridotite.	33.4
	Alp	Muscovite-quartz schist; commonly contains biotite, garnet, andalusite and cordierite; metamorphosed shale and siltstone.	12.2
	Aue	Talc (-carbonate-tremolite) schist.	7.8

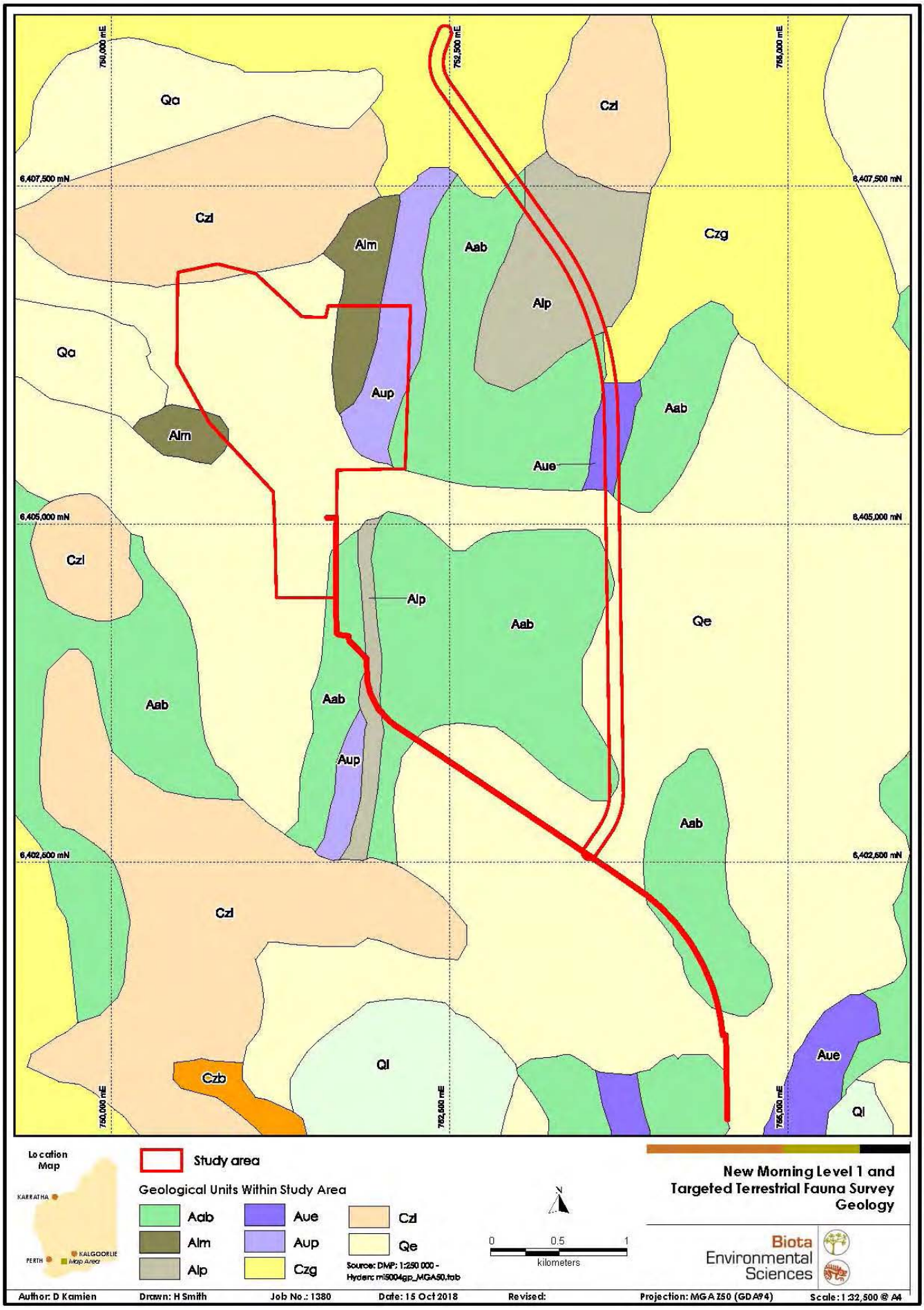

Figure 4.1: Geology of the study area.

4.3 Soils

Three soil units were mapped at a scale of 1:2,000,000 for the study area by Agriculture Western Australia (1967), (see Table 4.2 and Figure 4.2). Soil unit X17 represents the dominant soil, encompassing 75% of the study area.

Table 4.2: Soil units occurring in the study area.

Unit Code	Soil Description	Area (ha)
Ms8	Gently sloping to gently undulating plateau areas or uplands with long and very gentle slopes and, in places, abrupt erosional scarps: chief soils are (i) on depositional slopes, sandy yellow earths (Gn2.21 and Gn2.22) containing some ironstone gravels, and yellow earthy sands (Uc5.22) often with ironstone gravels at depths below 6-7ft; and (ii) on erosional ridges and slopes, ironstone gravels (KS-Uc4.11) together with (Uc4.11) and (Uc2.12) (both containing ironstone gravels), all underlain by hardened mottled-zone material by depths of 12-24 in. Soil dominance tends to vary locally between (i) and (ii) but overall the soils of (i) seem to have a slight dominance over the soils of (ii). Associated are smaller areas of other soils, such as (Dy3.82) containing ironstone gravels in its surface horizons. As mapped, small areas of units JJ16, Va66, DD9, X17, and possibly Sl28 are included.	5.5
X17	Slopes and valleys: chief soils are sandy neutral and alkaline yellow mottled soils (Dy5.42 and Dy5.43). Associated are various related (Dy) soils such as (Dy3.43) and (Dr) soils such as (Dr5.43); leached sands such as (Uc2.31); and areas of undescribed soils. There are similarities with unit Va66. As mapped, small areas of units JJ16, Ms8, Sl28, Sl29, and DD11 are included.	244
Ya28	Sandy plains with some clay pans and small salt lakes, dunes, and lunettes: chief soils are sandy alkaline yellow mottled soils (Dy5.43 and Dy5.83). Associated are various (Dr) soils such as (Dr5.43); more saline (Dy) and (Dr) soils including (Dy1.43), (Dr1.43), and (Dr1.83); some calcareous earths (Gc1.12) and (Gc1.22); and various (Uc), (Um), and/or (Uf) soils on small dunes and lunettes. As mapped, areas of adjacent units are included.	76

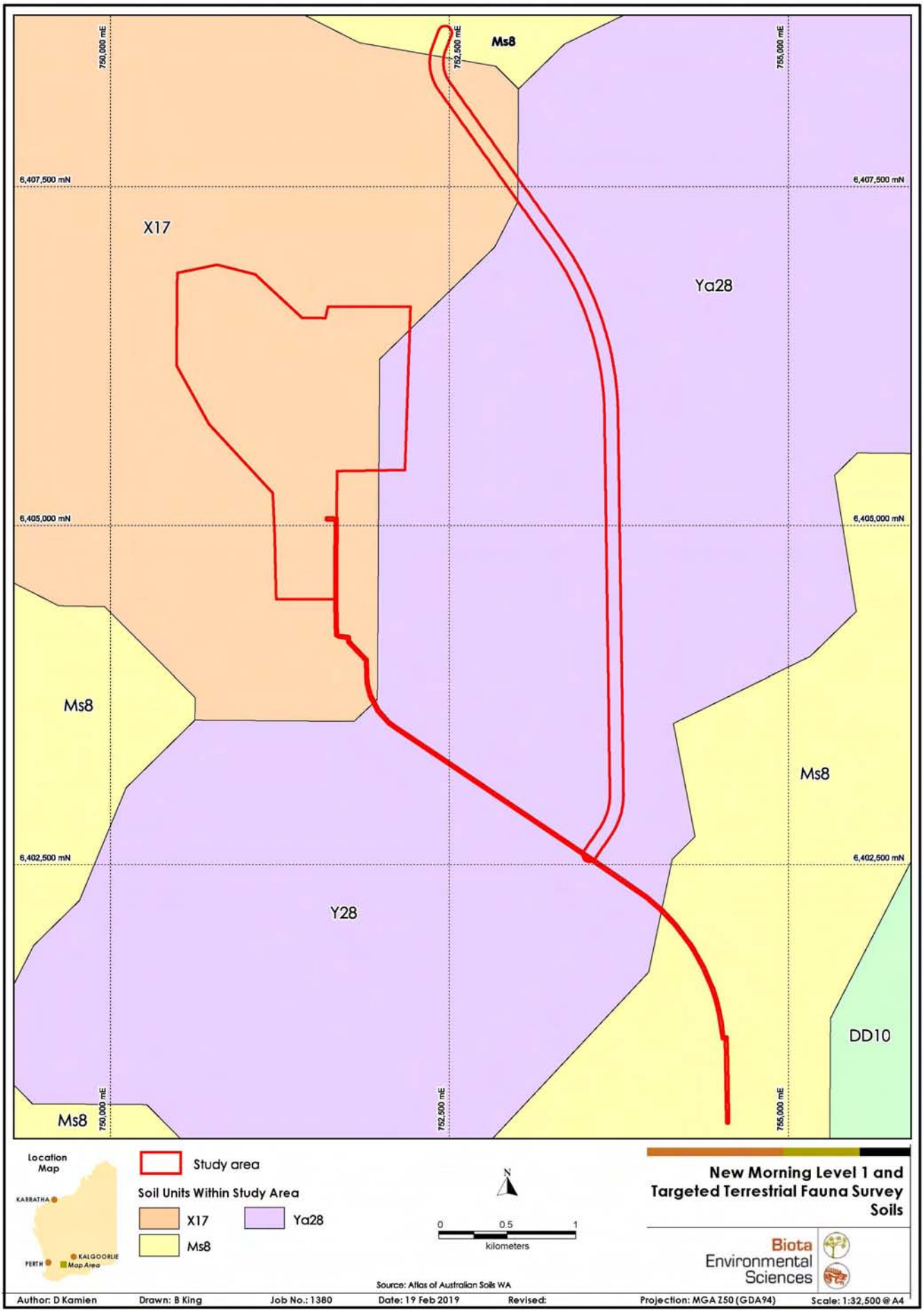

Figure 4.2: Soil units mapped for the study area and proximity.

4.4 Land Systems

Land systems mapping is currently unavailable for the study area. Future surveys may be carried out by the Western Australian Department of Agriculture.

4.5 Vegetation

The vegetation of the Coolgardie and Mallee bioregions was mapped by Beard (1981) at a scale of 1:1,000,000. The study area lies within the South-West Botanical Province as defined by Beard, specifically within two vegetation associations (Beard 1981):

- Forrestania 511.2: Medium woodland; Salmon Gum and Morel; and
- Forrestania 20148: Shrublands; scrub-heath in the Mallee Region.

At a finer scale, a recent flora and vegetation survey (Botanica Consulting In Prep.) identified seven discrete vegetation units within the study area, which can be grouped into three broad habitat types:

***Eucalyptus* woodland on clay-loam plain:**

1. Low open forest of *Eucalyptus flocktoniae / E. salubris / E. urna*;
2. Mid open woodland of *Eucalyptus salmonophloia*;
3. Burnt open low woodland of *Eucalyptus salmonophloia* over mallee shrubland of *E. pileata / E. tephroclada / E. celastroides* on clay-loam plain; and
4. Mid woodland of *Eucalyptus longicornis* on clay-loam plain.

Mallee woodland and shrubland:

5. Mid mallee shrubland of *Eucalyptus tephroclada / E. pileata* on stony rise; and
6. Mid mallee shrubland of *Eucalyptus tephroclada / E. pileata / E. transcontinentalis* on sand-loam plain.

Heathland:

7. Mid heathland of *Allocasuarina corniculata/ Acacia acuminata* on sandplain.

4.6 Conservation Reserves in the Locality

Lake Cronin Nature Reserve (1,016 ha) is located approximately 7 km northeast of the study area. This represents the only formally gazetted conservation reserve in the study area locality.

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5.0 Desktop Assessment

5.1 Previous Fauna Surveys in the Locality

Several fauna surveys targeting both vertebrate fauna and SRE invertebrate fauna have been conducted within 40 km of the study area since 2005 (Table 5.1).

Table 5.1: Previous relevant surveys conducted within 40 km of the study area.

Report/Survey	Survey Date	Survey Description
Forrestania Water Disposal Pipeline Fauna Survey (Biota 2006a)	January 2005	Single phase, Level 2 survey.
Diggers South Fauna Survey	November 2006	Single phase, Level 2 survey.
Forrestania Fauna Monitoring Survey (Biota 2006b, 2007a)	February 2005 November 2005 May 2006 November 2006	Four phase, Level 2 survey.
Forrestania Mygalomorph Studies (Biota 2009a)	January 2008 May 2008	Targeted mygalomorph spider survey.
Carnaby's Black-Cockatoo Habitat Assessment: Diggers South and Mossco (Biota 2008)	January 2008	Targeted Carnaby's Black-Cockatoo survey.
Forrestania Targeted Malleefowl Survey (Biota 2009b)	March 2008 May 2008 April 2009 August 2009	Targeted Malleefowl survey.
Spotted Quoll Haul Road Fauna (Biota 2010)	December 2009	Single phase, Level 2 survey.

5.2 Vertebrate Fauna

Nine amphibian species, 51 reptile species, 139 bird species and 23 mammal species were identified as potentially occurring in the locality of the study area, based on the results of the desktop assessment (Table 5.2 and Appendix 1).

Table 5.2: Vertebrate species identified from the desktop review and field survey.

Fauna Group	Number of Species
Amphibians	9
Reptiles	51
Avifauna	139
Native Mammals	18
Introduced Mammals	5
Total	**222**

Of these, 21 are State and Commonwealth listed conservation significant fauna species (Table 5.3). Table 5.3 presents the likelihood of occurrence of these taxa in the study area, considering the desktop results. The potential occurrence of these species within the study area was reassessed after taking into account the results of this survey (see Sections 7.2 and 7.3).

Table 5.3: Vertebrate taxa of conservation significance recorded or potentially occurring in study area.

Family	Species Name	Common Name	Conservation Status		Preferred Habitat	Occurrence in Locality	Likelihood of Occurrence in Study Area
			State	C'wealth			
Avifauna							
Psittacidae	*Pezoporus occidentalis*	Night Parrot	Schedule 1	En	Arid or semi-arid spinifex grasslands. Foraging habitat includes areas of samphire, bluebush and saltbush.	Nearest record is 400 km NW of study area.	Would not occur.
	Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	Schedule 2	En	Eucalypt woodland and mallee in southwest of Western Australia, where tree hollows with suitable dimensions for nesting and breeding are present.	Previously recorded in study area.	Recorded.
Megapodiidae	*Leipoa ocellata*	Malleefowl	Schedule 3	Vu	Dry inland scrub and mallee; occasionally in adjacent Eucalypt woodland.	Disused nesting mound previously recorded in study area.	Recorded.
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	Schedule 3; Schedule 5	CEn / M / Ma	Beaches and inland mudflats and lakes.	Recorded 80 km west of study area; core habitat not present in study area.	Unlikely to occur.
Apodidae	*Apus pacificus*	Fork-tailed Swift	Schedule 5	M / Ma	Varied landforms including coasts and urban areas, with a tendency to more arid areas. Almost exclusively aerial and does not breed in Australia.	Recorded at Lake Cronin, ~10 km NE of study area.	May potentially occur.
Motacillidae	*Motacilla cinerea*	Grey Wagtail	Schedule 5	M / Ma	Fast-flowing streams, often at high altitude; found in a greater variety of habitats outside of the breeding season.	Recorded ~400 km SW of study area.	Unlikely to occur.
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Schedule 5	M / Ma	Fresh and salt marshes, lakes, streams, sheltered coasts.	Recorded 80 km W of the study area; core habitat not present in study area.	Unlikely to occur.
	Tringa nebularia	Common Greenshank	Schedule 5	M / Ma	Estuaries, inland lakes and open swamps.	Recorded 80 km W of the study area; core habitat not present in study area.	Unlikely to occur.
	Calidris melanotos	Pectoral Sandpiper	Schedule 5	M / Ma	Lightly vegetated coastal or inland swamps.	Recorded ~200 km SW of study area; core habitat not present in study area.	Unlikely to occur.
	Calidris acuminata	Sharp-tailed Sandpiper	Schedule 5	M	Coastal, and interior wetlands.	Recorded ~13 km NE of study area in 1978; core habitat not present in study area.	Unlikely to occur.
Falconidae	*Falco peregrinus*	Peregrine Falcon	Schedule 7	–	Wide range of habitats including forest, woodlands, wetlands and open country.	Three recent records within 10 km of study area.	Likely to occur.

Family	Species Name	Common Name	Conservation Status		Preferred Habitat	Occurrence in Locality	Likelihood of Occurrence in Study Area
			State	C'wealth			
Charadriidae	*Thinornis rubricollis*	Hooded Plover	Priority 4	Ma	Ocean beaches and inland salt lakes.	Recorded ~20 km W of the study area adjacent to salt lake; core habitat not present in study area.	Unlikely to occur.
Psittacidae	*Platycercus icterotis xanthogenys*	Western Rosella (inland subspecies)	Priority 4	–	Open forest and woodland.	Numerous records within 5 km of study area	Likely to occur.
Ardeidae	*Ardea modesta*	Eastern Great Egret	–	Ma	Shallow fresh water such as river pools, lakes, large dams and sewage ponds.	Recorded approximately 75 km W of the study area adjacent to wetland. Core habitat not present in study area.	Unlikely to occur.
	Ardea ibis	Cattle Egret	–	Ma	Well-watered areas such as damp pastures and wetlands; not common in arid areas.	Nearest record ~230 km SE of study area near Esperance; core habitat not present in study area.	Unlikely to occur.
Cuculidae	*Chalcites osculans*	Black-eared Cuckoo	–	Ma	Inland low shrubs and dry forest.	Recorded ~50 km N of study area.	May potentially occur.
Meropidae	*Merops ornatus*	Rainbow Bee-eater	–	Ma	Nests in small holes excavated in sandy banks or flat sandy surfaces; occurs in landforms that provide suitable soil for nesting and a tall stratum of vegetation for perching.	Numerous records within 5 km of study area.	Likely to occur.
Mammals							
Dasyuridae	*Dasyurus geoffroii*	Western Quoll, Chuditch	Schedule 3	Vu	Eucalypt forest and woodland, heathland and mallee.	Previously recorded within 5 km of study area.	Likely to occur.
	Phascogale calura	Red-tailed Phascogale	Schedule 6	Vu	Dense, mature forests, providing tree hollows.	Previously recorded within 10 km of study area.	May potentially occur.
Macropodidae	*Notamacropus irma*	Western Brush Wallaby	Priority 4	–	Open forest or woodland.	Previously recorded within 35 km of study area.	May potentially occur.
Herpetofauna							
Elapidae	*Paroplocephalus atriceps*	Lake Cronin Snake	Priority 3	–	Open forest, woodland and mallee.	Previously recorded within 10 km of study area.	Likely to occur.

5.3 SRE Invertebrate Fauna

There are considerable data for the locality of the study area from previous invertebrate surveys in the region (WAM arachnid and mollusc databases; Appendix 3). The majority of the records were lodged by the WAM, DBCA and Biota.

Although there have been multiple collections within the study area locality of targeted groups known to contain SRE species (Appendix 3), none are listed as conservation significant. The consolidated data from the searches yielded a total of 24 species level taxa belonging to potential SRE groups, comprising:

- 336 previous records of Mygalomorphae (mygalomorph spider) from the locality, representing at least 22 nominal species from five families;
- three Diplopoda (millipede) records from the locality, representing one nominal species from the family Paradoxosomatidae; and
- two Pulmonata (land snail) records from the locality, representing one nominal species from the family Bothriembryontidae.

Of the 24 invertebrate taxa retrieved from database searches, only nine represent potential SREs (Table 5.4). Of these, seven taxa are known or considered likely to occur within the study area. Although other invertebrate taxa from groups known to contain SREs are likely to occur within the study area, their distribution is large and they do not represent SREs (Appendix 3).

Table 5.4: Potential SRE taxa returned from database search.

SRE Group	Family	Species	Recorded Distance to Study Area (km)	Recorded Habitat	Likelihood of Occurrence in Study Area
Mygalomorph Spider	Actinopodidae	*Missulena* `MYG042`	30	Heath on sand plain.	May potentially occur
	Idiopidae	*Eucanippe mallee*	53	Sand-loam adjacent to agricultural land.	Unlikely to occur
		Gaius `MYG063`	10	Adjacent to salt lakes.	Unlikely to occur
		Idiosoma `MYG064`	0	Clay-loam and sand-loam soil.	Recorded
		Idiosoma `MYG065`	0	Clay-loam and sand-loam soil.	Recorded
	Nemesiidae	*Aname* `MYG182`	13	Heath on sand plain	Likely to occur
		Aname `MYG461`	10	Indet.	May potentially occur
		Teyl `MYG068`	28	Open eucalypt woodland on clay-loam soil.	May potentially occur
Land Snail	Bothriembryontidae	*Bothriembryon* `Lake Cronin` n. sp.	7	Clay-loam and sand-loam soil.	May potentially occur

6.0 Survey Results

6.1 Fauna Habitats

Fauna habitats were identified primarily on the basis of substrate and vegetation units, with consideration of the ecological niches relevant to fauna. Three fauna habitats were identified in the study area using on-ground habitat assessment in combination with vegetation mapping provided by Botanica Consulting (In Prep.). These are outlined in Table 6.1 and mapped in Figure 6.1.

Table 6.1: Fauna habitats identified within the study area.

Habitat	Proportion of Study Area (ha)	Photo
Eucalyptus woodland on clay-loam plain.	248.4 (76.3 %)	
Mallee woodland and shrubland on sand-loam plain or stony rise.	43.9 (13.5 %)	
Heathland on sandplain	10.9 (3.3 %)	
Predominantly cleared	14.1 (4.3%)	No image
Undetermined	8.2 (2.5%)	No image

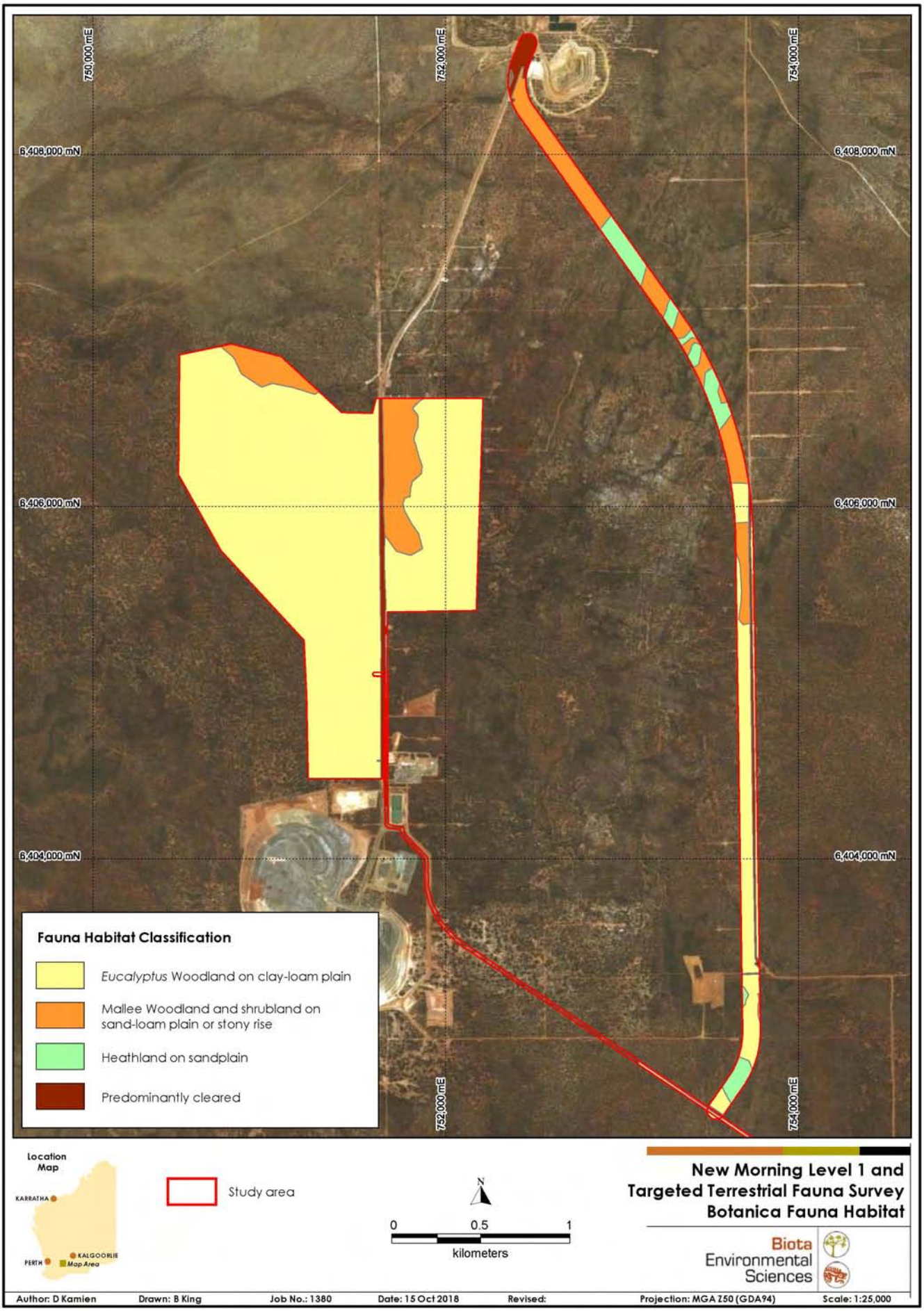

Figure 6.1: Fauna habitats within the study area.

6.2 Conservation Significant Vertebrates

During the field survey, a single Chuditch (*Dasyurus geoffroii*) was captured and evidence of Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) and Malleefowl (*Leipoa ocellata*) were recorded within the study area. No other vertebrates of conservation significance were recorded.

6.2.1 Carnaby's Black-Cockatoo

6.2.1.1 Breeding Habitat Trees

A total of 1,445 breeding habitat trees were recorded in the study area during the survey (Table 6.2, Figure 6.2 and Appendix 4). Of these, 186 trees were found to have potentially suitable nesting hollows, representing 12.9% of all breeding habitat trees within the study area. Trees identified as *Eucalyptus salmonophloia*, *E. urna* and stag trees comprised the majority of hollows within the study area (Table 6.2 and Figure 6.3).

A subsequent and more detailed survey of the identified potential nesting hollows revealed all but one hollow to be unsuitable for Carnaby's Black-Cockatoo nesting due to them being "too small and shallow, blocked with debris, burnt off stumps or with small jagged floors" (Johnstone and Kirkby 2019). The suitable hollow was located within a Salmon Gum tree on the proposed haul road alignment.

Table 6.2: Summary of breeding habitat trees and hollows.

Tree Species	No. of Breeding Habitat Trees	No. of Hollow-Bearing Trees	Percentage of Hollow-Bearing Trees	Suitable Nesting Hollows*
Eucalyptus salmonophloia	704	54	7.7	1
Eucalyptus urna	560	60	10.7	0
Eucalyptus transcontinentalis	38	6	15.7	0
Eucalyptus longicornis	8	1	12.5	0
Indeterminate stag trees	135	65	48.1	0
Total	**1,445**	**186**	**12.9**	**1**

* (Johnstone and Kirkby 2019).

6.2.1.2 Signs of Carnaby's Black-Cockatoo

No direct signs of Carnaby's Black-Cockatoo breeding were observed during the 2018 survey; that is, no cockatoos were observed returning to hollows to nest or tend to chicks, despite the survey timing falling into breeding season for the species. However three Carnaby's Black-Cockatoos were observed in the study area in January 2019 (Johnstone and Kirkby 2019).

Although scarring, wear, chew marks and scratch marks were noted on the trunks and branches of 10 of the 1,445 trees recorded, it is not certain that these sign were created by Carnaby's Black-Cockatoo. Additionally, none of these sign were present on hollows (which would indicate potential previous hollow occupancy). This was subsequently confirmed during a more detailed investigation of the hollows (Johnstone and Kirkby 2019).

Quandong (*Santalum acuminatum*) and *Allocasuarina* sp. fruit chews were observed at seven different locations during the survey, indicating feeding sites (Figure 6.4).

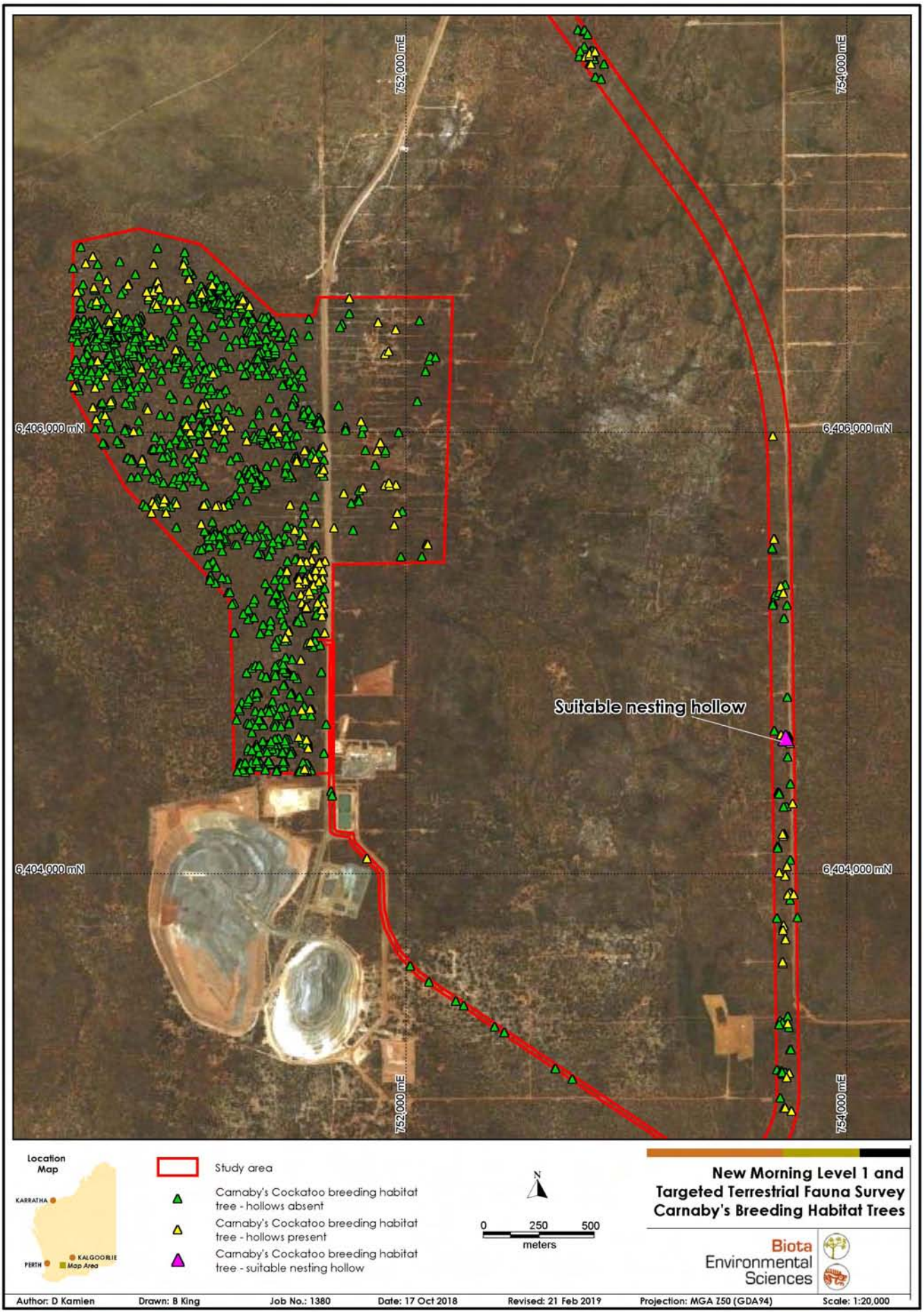

Figure 6.2: Carnaby's Black-Cockatoo breeding habitat trees recorded during the survey.

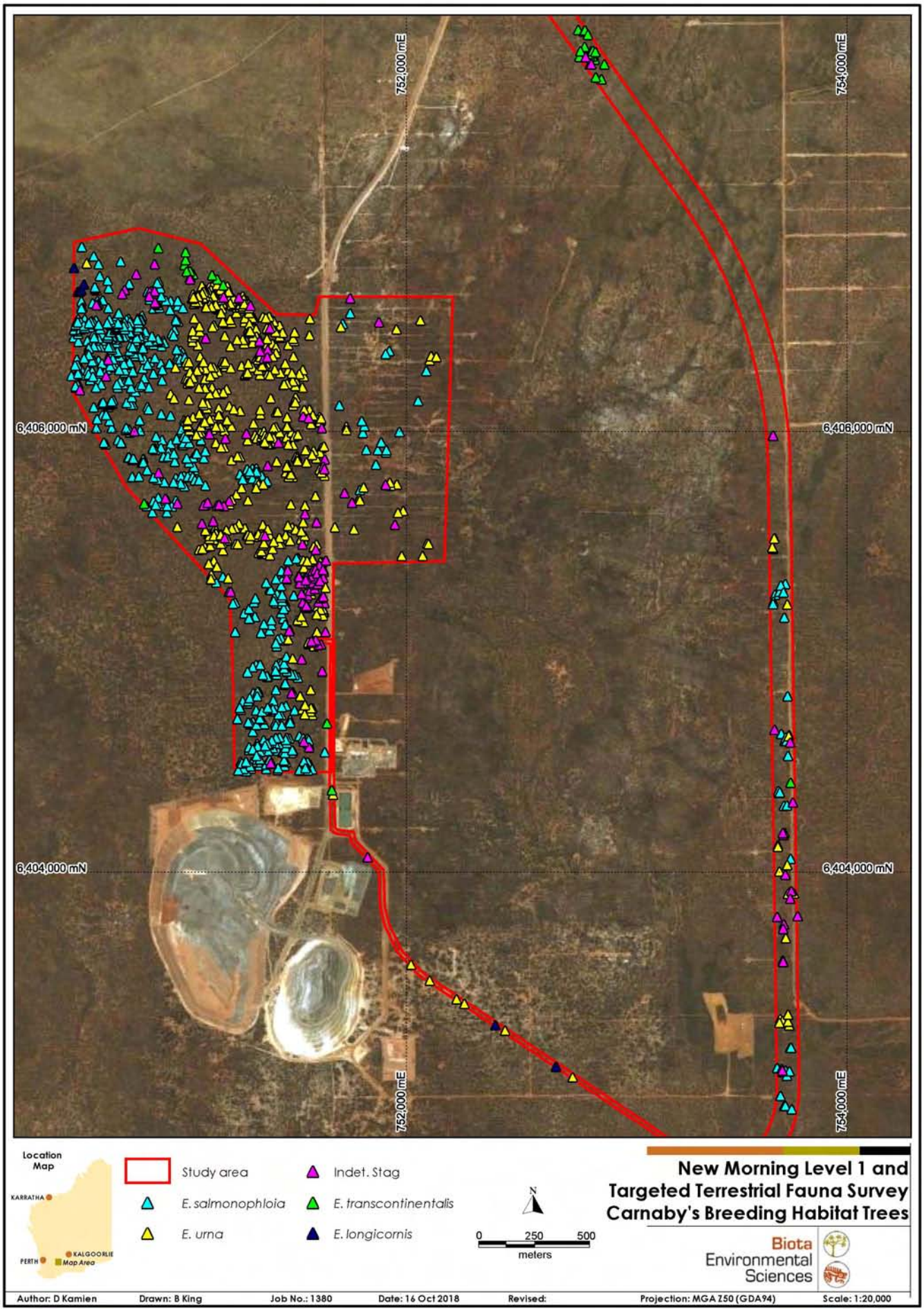

Figure 6.3: Carnaby's Black-Cockatoo breeding habitat trees by species.

6.2.2 Malleefowl

Six inactive Malleefowl nesting mounds were identified within the study area during the survey and Malleefowl tracks were also recorded at a single location (Table 6.3, Plate 6.1 and Figure 6.5). All secondary evidence of Malleefowl detected during the survey was recorded from *Eucalyptus* woodland habitat. A single Malleefowl was also observed approximately 10 km southeast of the study area.

Table 6.3: Location and status of Malleefowl records.

Item	Estimated Age (years)	Habitat	Easting (mE)	Northing (mN)	Date
Nesting mound 1	>10	*Eucalyptus* Woodland	750824	6405713	31/8/2018
Nesting mound 2	>10	*Eucalyptus* Woodland	751538	6405833	31/8/2018
Nesting mound 3	>10	*Eucalyptus* Woodland	751582	6404962	31/8/2018
Nesting mound 4	>10	*Eucalyptus* Woodland	751536	6405133	2/9/2018
Nesting mound 5	>10	*Eucalyptus* Woodland	750878	6406707	2/9/2018
Nesting mound 6	>10	*Eucalyptus* Woodland	750559	6406865	5/9/2018
Tracks	–	*Eucalyptus* Woodland	751458	6406233	1/9/2018
Individual sighting	–	Mallee woodland – outside study area	754616	6394985	4/9/2018

Plate 6.1: Malleefowl nesting mound 5.

Plate 6.2: Malleefowl tracks.

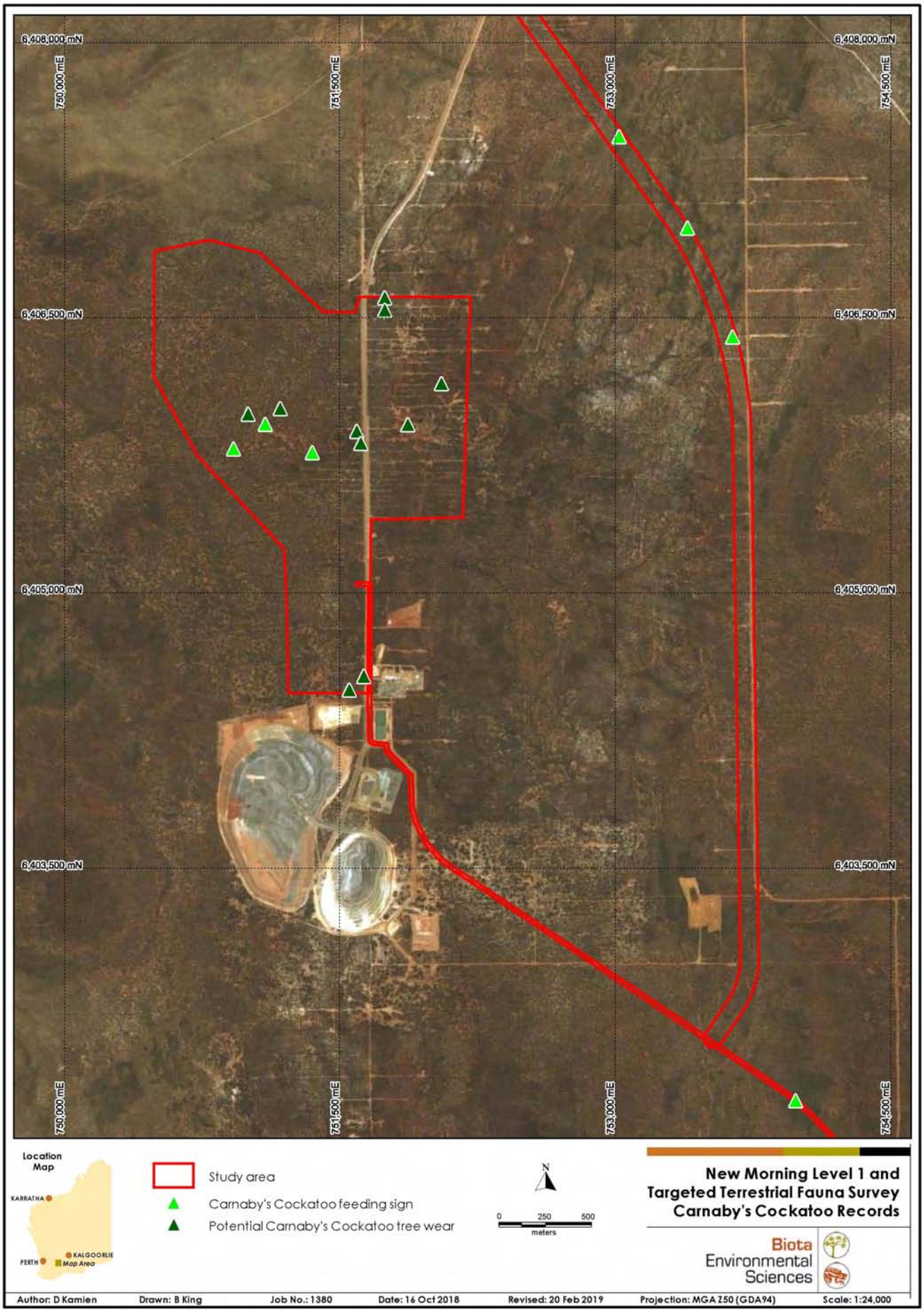

Figure 6.4: Carnaby's Black-Cockatoo sign recorded during the survey.

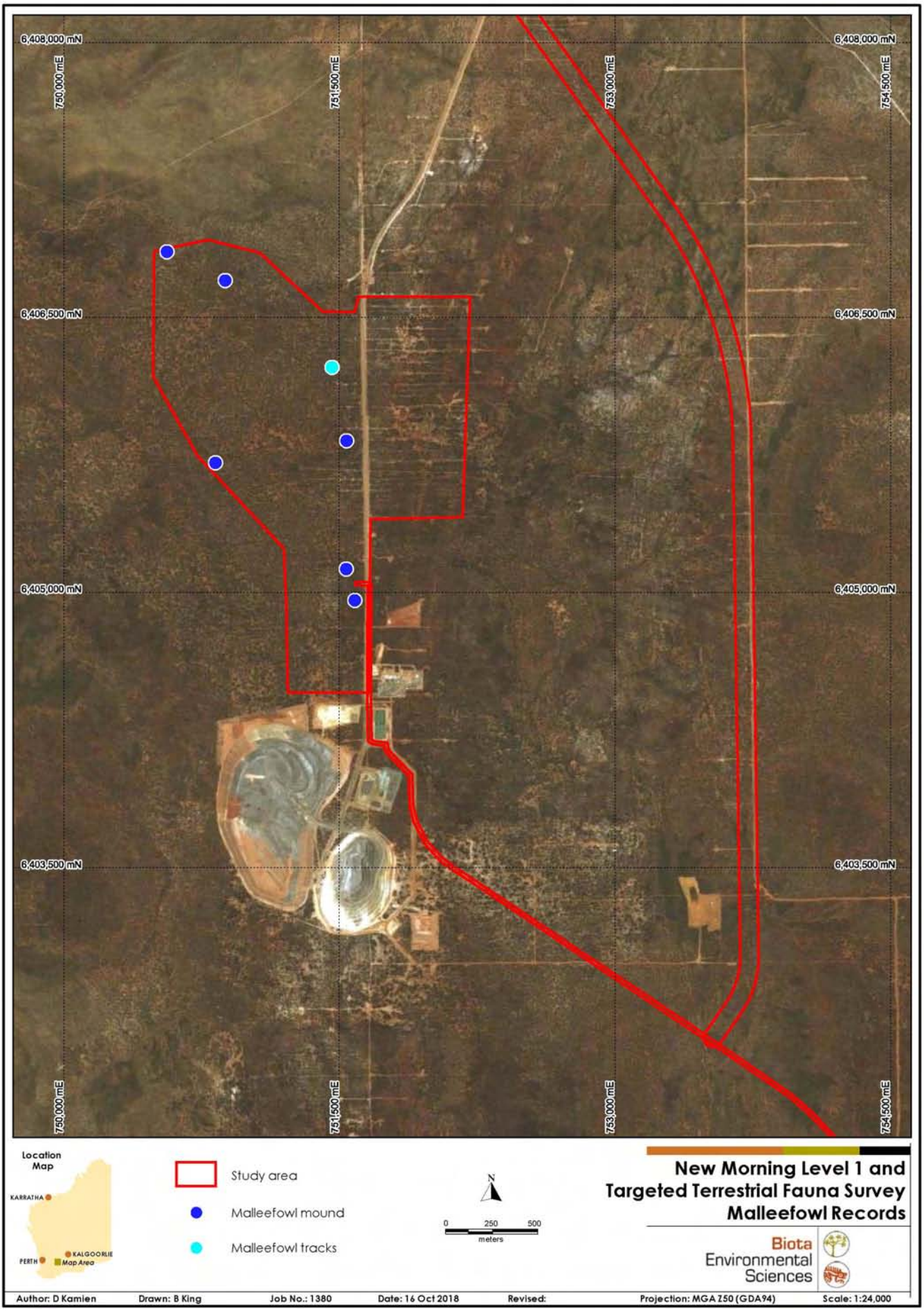

Figure 6.5: Malleefowl sign recorded during the survey.

6.2.3 Chuditch

An adult male Chuditch was captured at site NME01 in a large Elliott trap on 1st August 2018 (Plate 6.3 and Table 6.4). Chuditch scats were also recorded at site NMM4 and opportunistically at 751123 mE, 6406253 mN (Figure 6.6). Remote cameras did not record any Chuditch individuals.

Plate 6.3: Chuditch captured at NME01.

Table 6.4: Details of captured Chuditch.

Parameter	Measure
Condition	Good
Weight	980 g
Tail length	320.0 mm
Head length	94.6 mm
Pes (hind foot length)	50.0 mm

Figure 6.6: Chuditch individual and scats recorded in the study area.

6.3 Short-Range Endemic Invertebrates

Three higher-order taxonomic groups with the potential to include SRE species were recorded in the study area, comprising mygalomorph spiders, millipedes and land snails. Sections 6.3.1.1 to 6.3.1.3 provide accounts of each group and detail the SRE status of each species (where known). Table 6.5 summarises the taxa recorded by sites and habitat type, while their distribution is shown in Figure 6.7.

6.3.1 Mygalomorph Spiders

Twelve mygalomorph spiders from three families (Actinopodidae, Idiopidae and Nemesiidae) were collected during the survey, nine of which were successfully sequenced (Table 6.5, Figure 6.7) (see Appendix 5).

6.3.1.1 Actinopodidae

Missulena sp. AYA 16

Habitat
Missulena sp. AYA A16 was recorded from the *Eucalyptus* woodland on clay-loam plain habitat, from soil unit X17.

Distribution
A single individual of this species was recorded from site NMSRE11 (Table 6.5, Figure 6.7). From the current publicly available data on GenBank (including museum specimens), combined with the extensive Helix molecular database (Appendix 5), no other individuals of this species have been previously recorded. Based on the current data, this species has a restricted distribution, being known from only a single locality. Although it is difficult to extrapolate a potential wider distribution for the species, the *Eucalyptus* woodland on clay-loam plain extends beyond the study area and the species' distribution may follow this habitat. Similarly the soils unit X17 is contiguous with the study area and common in the locality.

SRE status
Missulena sp. AYA A16 represents a potential SRE based on the criteria outlined in Table 3.6.

6.3.1.2 Idiopidae

Idiosoma sp. IA 1121

Habitat
Idiosoma sp. IA I121 was recorded from the *Eucalyptus* woodland on clay-loam plain habitat, from soil units X17 and Ya28.

Distribution
This species was represented by six specimens collected from four sites during the survey (Table 6.5, Figure 6.7). It has previously been recorded from Forrestania (Biota 2009a). Based on these records, it has a minimum spanning area of 24.5 km^2.

SRE status
Idiosoma sp. IA I121 represents a potential SRE based on the criteria outlined in Table 3.6.

Aganippe sp. I67

Habitat
Aganippe sp. I67 was recorded from the *Eucalyptus* woodland on clay-loam plain habitat, from soil unit X17.

Distribution
This species was represented by a single specimen collected from site NMSRE01 during the survey (Table 6.5, Figure 6.7). Based on GenBank (including museum specimens) and the extensive Helix molecular database (Appendix 5), no other individuals of this species have been previously collected. Based on the current data, this species has a restricted distribution, being known from only a single locality. Although it is difficult to extrapolate a potential wider distribution for the species, the *Eucalyptus* woodland on clay-loam plain extends beyond the study area and the

species' distribution may follow this habitat. Similarly the soils unit X17 is contiguous with the study area and common in the locality.

SRE status
Aganippe sp. I67 represents a potential SRE based on the criteria outlined in Table 3.6.

6.3.1.3 Nemesiidae

Chenistonia sp. N68

Habitat
Chenistonia sp. N68 was recorded from the *Eucalyptus* woodland on clay-loam plain vegetation, from soil unit X17.

Distribution
This species was represented by a single specimen collected from site NMSRE06 during the survey (Table 6.5, Figure 6.7). It has previously been recorded from Forrestania (Biota 2009a). Based on these records, it has a minimum spanning area of 13.2 km^2.

SRE status
Chenistonia sp. N68 represents a potential SRE based on the criteria outlined in Table 3.6.

Table 6.5: Putative mygalomorph species recorded during the survey (SRE status is based on criteria outlined in Table 3.6).

Family	Genus	Species Lineage (Appendix 5)	Burrow Entrance	Curated Specimen	Specimen Morphology	Sites Recorded	Maximum Spanning Distance (km)	Minimum Spanning Area (km²)	Records Outside Study Area	SRE Status
Actinopodidae	*Missulena*	sp. I6 Lineage AYA				NMSRE11	N/A	N/A	None known.	Potential SRE.
Idiopidae	*Aganippe*	sp. I67 Lineage ICV				NMSRE01	N/A	N/A	None known.	Potential SRE.
	Idiosoma	sp. I121 Lineage IA				NM06 NMSRE03 NMSRE05 NMSRE07	16 km	24.51 km²	Six individuals from five localities at Forrestania (Biota 2009a).	Potential SRE.
	Indet.	Sequencing failed (Based on field ID and burrow type, it is suspected to be the same species as *Aganippe* sp. I167.)		-	-	NMSRE02	N/A	N/A	Cannot be determined.	Cannot be determined.

Family	Genus	Species Lineage (Appendix 5)	Burrow Entrance	Curated Specimen	Specimen Morphology	Sites Recorded	Maximum Spanning Distance (km)	Minimum Spanning Area (km²)	Records Outside Study Area	SRE Status
Idiopidae	Indet.	Sequencing failed.			-	NMSRE07	N/A	N/A	Cannot be determined.	Cannot be determined.
	Indet.	Sequencing failed.	-		-	NMSRE09	N/A	N/A	Cannot be determined.	Cannot be determined.
Nemesiidae	*Chenistonia*	sp. N68 Lineage NCF			-	NMSRE06	13 km	13.22 km²	One record at Forrestania (Biota 2009a).	Potential SRE.

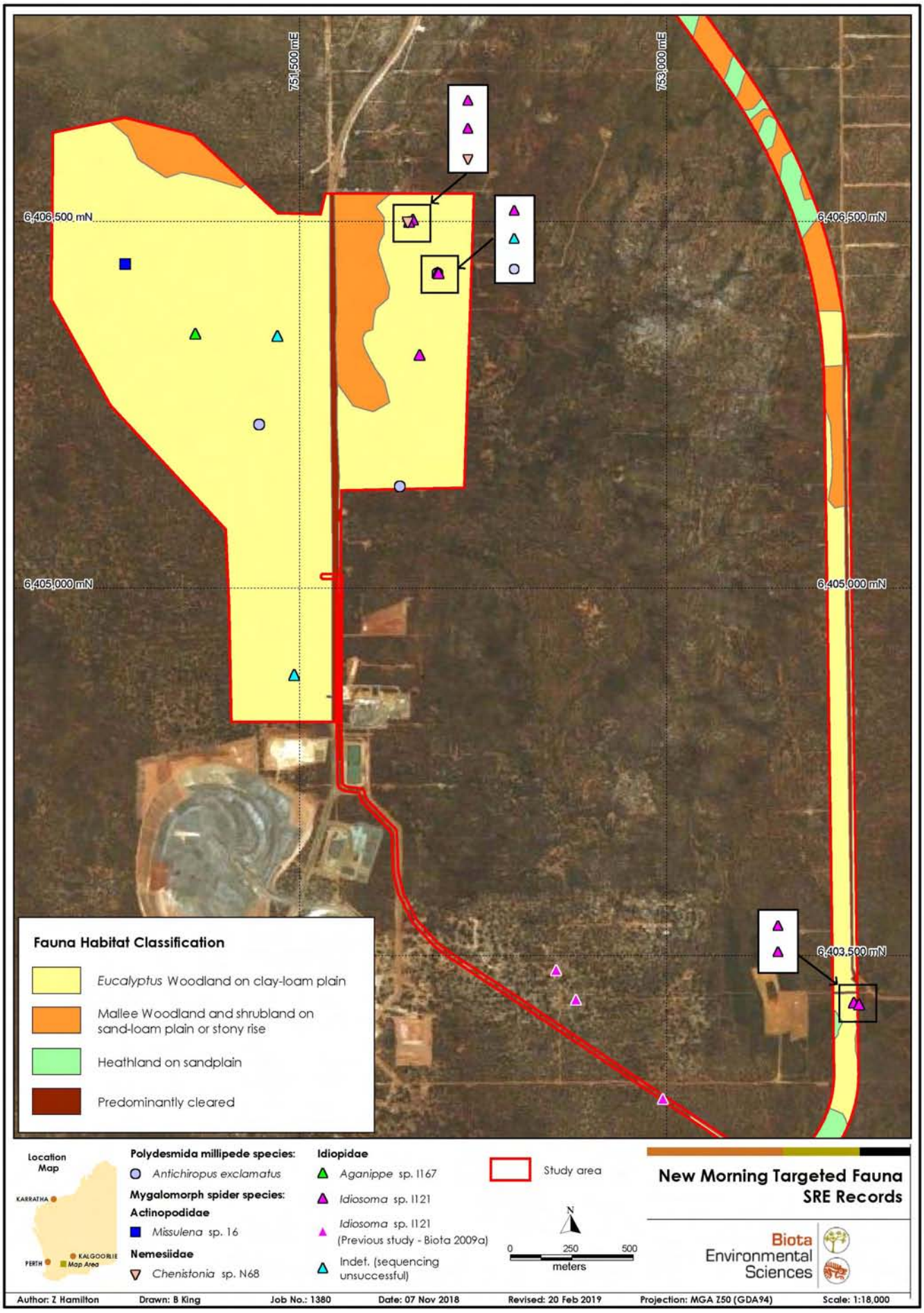

Figure 6.7: SRE records from New Morning.
Sites outlined in black are SRE invertebrate records for the New Morning survey. Symbols for previous records of mygalomorph spider species are shown without black outlines.

6.3.2 Millipedes

A total of five polydesmid millipede specimens were collected from three sites during the survey (NMSRE07, NMSRE08, and NMSREOPP-01), all of which were identified as *Antichiropus exclamatus;* this widespread species is not considered an SRE (Car and Harvey 2014) (Table 6.6 and Figure 6.7).

Distribution
The species has a relatively broad distribution in the Great Western Woodlands ranging from Pyramid Lake (32°06'31"S, 120°00'03"E) to Newman Rocks (32°06'50.9"S, 123° 10'22.6"E) (Car and Harvey 2014).

Habitat
The genus is a known litter dweller and occurs in mesic habitats in the southwest of Western Australia. All millipedes collected during the survey were located by raking through leaf litter and searching under logs.

SRE Status
Antichiropus exclamatus does not represent an SRE based on the criteria outlined in Table 3.6.

Table 6.6: Millipede taxa collected from the study area.

Species	Specimen Codes	Site	n	Latitude	Longitude
Antichiropus exclamatus	D20180904NMMSRE07-01	NRMSRE07	1	-32.57850531	119.7273033
	D20180905NMMSRE08-01	NRMSRE08	2	-32.45992821	119.6800216
	NMMSREOPP-01	NRMSREOPP-01	2	-32.45777121	119.6738553

Plate 6.4: *Antichiropus exclamatus* from site NMSREOPP-01.

6.3.3 Land Snails

Bothriembryon shells were observed at NMSRE05 but no live individuals were located. Shells were not collected due to their deteriorated nature, but other work in the wider locality has commonly found morphologically similar shells to represent the widespread species *Bothriembryon dux*, which is not an SRE (Biota 2018).

7.0 Discussion and Conclusions

7.1 Desktop Assessment

Prior to the survey, the Malleefowl represented the only MNES fauna species recorded in the study area. Based on the desktop assessment, a further two species were deemed likely to occur (Carnaby's Black-Cockatoo and Chuditch), and the Red-tailed Phascogale was considered to potentially occur (Section 5.2). During the current survey, Carnaby's Black-Cockatoo, Malleefowl and Chuditch were confirmed to occur within the study area, as discussed in Section 7.2.

7.2 Field Survey

7.2.1 Fauna Habitats

Based on desktop and field survey results (Sections 5.0 and 6.0), the MNES species that were recorded or potentially occur within the study area may utilise the three identified fauna habitats as presented in Table 7.1.

For each MNES species, the fauna habitats may be classified as:

1. "core", equivalent to "habitat critical to the survival of the species" (DotE 2013); this comprised habitat considered to potentially contain roosting, denning or breeding sites, primary foraging areas, or refugia during drought, fire or other stress; or
2. "secondary" – these comprised the remaining habitats of the study area, which may be used on a transitory, dispersing or occasional basis, but do not represent core habitat.

Table 7.1: Probable MNES species habitat utilisation.

MNES Species	Habitat		
	***Eucalyptus* Woodland**	**Mallee Woodland**	**Heathland**
Carnaby's Black-Cockatoo	Breeding and Foraging	Foraging	Primary Foraging
Malleefowl	Breeding	Breeding	Possible Breeding
Chuditch	Breeding	Breeding	Breeding
Red-tailed Phascogale	Possible Breeding	–	–

Orange cells indicate core habitat; yellow cells indicate secondary habitat.

It is assumed that some proportion of core habitat must be maintained across the species' range to ensure the persistence of the species in the region. All three identified habitats within the study area are common within the locality and occur contiguously with the same habitat types outside of the study area. Therefore, although MNES fauna within the development footprint may be impacted, it is not likely to affect the persistence of these species in the locality. Similarly, the overall fauna assemblage within the study area would not be unique and would also occur outside of the study area.

7.2.2 Carnaby's Black-Cockatoo

The occurrence of breeding habitat trees and potential nesting hollows within the study area[2] is outlined in Section 6.2.1 and Appendix 5. Western Areas may use these data to:

1. inform preliminary design constraints to assist in refining the mine and infrastructure footprint;
2. identify trees with potential breeding significance to Carnaby's Black-Cockatoos that will be directly impacted by the final construction design, in order develop appropriate management and monitoring responses; and
3. inform potential environmental offset initiatives or requirements.

The study area is located at the easternmost extent of the species' distribution and may not be considered a significant breeding location. Nevertheless, Carnaby's Black-Cockatoos have been recorded nesting in Salmon Gum hollows in the locality (Ron Johnstone, WA Museum, pers. comm. October 2018). Based on feeding sign it is clear that Carnaby's Black-Cockatoos utilise the study area for foraging (Figure 6.4), within 'high quality' foraging habitat defined under the draft revised guidelines (DoEE 2017).

Although all breeding habitat trees reported here meet the DBH requirements of the current DSEWPaC (2012a) guidelines, the tree deemed to contain a suitable nesting hollow (Johnstone and Kirkby 2019) should be considered of more immediate significance to Carnaby's Black-Cockatoo breeding, and would be the primary tree to consider in the context of points 1 and 2 above (see Appendix 4 and Johnstone and Kirkby 2019). In general, consideration of suitable nesting hollows is particularly important for Salmon Gum (*Eucalyptus salmonophloia*), a species where Carnaby's Black-Cockatoo breeding has been recorded (DSEWPaC 2012a; Ron Johnstone, WA Museum, pers. comm. 2018). Hollows of all tree species may potentially be utilised for nesting, but species other than Salmon Gum are less likely to contain suitable nesting hollows (Ron Johnstone, pers. comm. October 2018). This was confirmed during closer examination of identified hollows within the study area (Johnstone and Kirkby 2019).

The loss of mature, hollow-bearing trees (and future hollow-bearing trees) necessary for breeding and the loss of existing foraging habitat constitute the main potential impacts of mine development on Carnaby's Black-Cockatoo. As outlined in the referral guidelines (DSEWPaC 2012a) and in Section 7.3, where possible mitigation and management actions should prioritise impact avoidance and incorporate mine and infrastructure design to minimise clearing of black-cockatoo habitat.

7.2.3 Chuditch

A single Chuditch was recorded during the survey, with secondary sign recorded at two additional locations. It is apparent that Chuditch are widespread in the Forrestania locality, with the species having been recorded previously at multiple locations (Biota 2006b, 2007a, 2010).

The major threats to Chuditch as outlined in DEC (2012) encompass:

- land clearing, including the removal of suitable den logs and den sites;
- predation by, and competition from, foxes and feral cats; and
- deliberate and accidental mortality from poisoning, trapping, illegal shooting, and road kills.

Construction of the proposed New Morning mine and associated infrastructure is unlikely to affect the Chuditch population in the locality. However, it may cause localised mortality of individual animals as a result of land clearing, and could result in localised increase in the threat of predation from cats and foxes in the locality of the development (see Section 7.3).

[2] This included all tree species of DBH greater than 300 mm, as referral guidelines (DSEWPaC 2012a) state that "In a woodland stand with trees of suitable diameter at breast height, all trees of all ages and size are potentially important for maintaining breeding in the long term". This is supported by Ron Johnstone of the WA Museum (pers. comm., October 2018).

7.2.4 Malleefowl

Malleefowl tracks were observed in study area, confirming their current presence. However, although six Malleefowl mounds were recorded in the study area, none have been utilised for at least 10 years, indicating an absence of recent breeding within the study area. This may indicate that Malleefowl are in decline locally, as is the case over much of the state (Benshemesh 2007). Such a decline may be a result of a drying climate, or may be an indication of mortality through predation from feral cats and foxes, which may be higher in *Eucalyptus* woodland compared to more dense habitats such as Mallee. However, it is also possible that the *Eucalyptus* woodland in the locality (which comprises 76.3% of the study area) is naturally less conducive to breeding than comparable habitat in other parts of the state.

As Malleefowl range over a wide area and no recent breeding activity was noted in the study area, construction of the proposed mine and associated infrastructure is likely to have a minimal effect on the Malleefowl population in the locality. As for the Chuditch, mitigation measures to counter the effect of land clearing may be required (see Section 7.3).

7.2.5 Short-Range Endemic Invertebrates

Four putative mygalomorph spider species from three families (the Actinopodidae, Idiopidae and Nemesiidae) were recorded from the study area. All of these are considered to be potential SRE taxa. Two of the species have been recorded previously in the locality and it is probable that the other two species also occur at least as widely.

The *Antichiropus exclamatus* millipede collected from the New Morning survey area has a broad distribution and is not considered an SRE, and the land snail shells sighted in the study area are also unlikely to represent an SRE species.

From an SRE perspective, the habitats identified within the study area are typical of those occurring in the wider subregion, and they are also contiguous with very similar habitat extending beyond the study area. Using habitat as a surrogate to infer wider distributions, it is unlikely that any of the potential SRE taxa recorded would be restricted solely to the study area, as there are no geomorphological or habitat attributes that would suggest a high risk of species level distributions being restricted to the scale of the current study area.

7.3 Impact Assessment of Conservation Significant Vertebrates

When assessing potential impacts to fauna of conservation significance, both direct and indirect impacts should be considered. However, these are often difficult to quantify and predict prior to development. For example, the direct impact of habitat loss can be estimated and quantified, but the ultimate impact (assumed to be proportionate loss of individuals from the population) is usually not well demonstrated, even if the population extent and demography is well documented.

Although the exact scale and design of the proposed mine and associated infrastructure has not been finalised, it is possible that the degree and magnitude of impacts such as noise, vibration, light spill, dust, vehicle movements, changes in fire regimes, and increased competition or predation by introduced fauna can be modelled to provide a quantified prediction. However, the effect on conservation significant specific has not been well studied in the literature, so determining the final impact remains largely subjective.

Within these constraints, Table 7.2 provides a summary of the predicted impacts on conservation significant species occurring or potentially occurring within the study area.

Table 7.2: Summary of localised predicted impacts for conservation significant species occurring, likely to occur or that have the potential to occur within the study area.

		Impact			
Species	**Impact Factor**	**Extent**	**Duration**	**Magnitude**	**Certainty**
Schedule 2 species					
Carnaby's Black-Cockatoo Recorded	Foraging habitat loss.	Clearing imposed on core foraging habitat.	Permanent	*Low* – although evidence of Carnaby's Black-Cockatoo feeding exists within the study area, primary foraging habitat (heathland) is not extensive.	*High* – area of heathland to be potentially cleared is negligible. Small breeding population of this species occurs in locality (Johnstone and Kirkby 2019).
	Loss of suitable hollow bearing trees for nesting.	Clearing imposed on core breeding habitat.	Permanent	*Low* – Only one hollow deemed suitable for nesting was identified (Johnstone and Kirkby 2019).	*High* – study area was surveyed extensively by Biota and dedicated hollow investigations were conducted (Johnstone and Kirkby 2019).
	Loss of breeding habitat trees.	Clearing imposed on core breeding habitat.	Permanent	*Moderate* – Breeding habitat trees as defined in the EPBC Act Referral Guidelines (DSEWPaC 2012a), would be cleared during mine and infrastructure construction. However, such trees are common and widespread in locality.	*High* – study area was surveyed extensively by Biota. DBH of each tree was determined.
	Habitat modification through more frequent or higher intensity fires.	Potential extent of bushfires	Short to Long-term	*Low* – may have some effect on foraging areas and habitat nesting trees. High intensity fires likely to destroy hollow-bearing trees.	*High* – fires as a result of mining operations are not expected and if they occur, suitable emergency response and mitigation measures are in place.
	Vehicle collision.	Expansion of existing road network.	Long-term	*Moderate* – Carnaby's Black-Cockatoo often feed in tree canopies, but may be foraging at lower levels in heath. They often swoop low on take-off from trees.	*Moderate* – traffic on existing roads is unlikely to change significantly, but additional roads in mine proximity represent an additional localised threat.
Schedule 3 species					
Malleefowl Recorded	Habitat loss	Extent of clearing imposed on core habitat.	Permanent	*Moderate* – species known to occur in study area and core habitat exists.	*Moderate* – although nesting mounds were recorded, none have been recently active.
	Habitat modification through more frequent or higher intensity fires.	Potential extent of bushfires.	Short to Long-term	*Low* – may have some effect on foraging areas.	*High* – fires as a result of mining operations are not expected and if they occur, suitable emergency response and mitigation measures are in place.
	Vehicle collision.	Expansion of existing road network.	Long-term	*Moderate* – potential to occur if Malleefowl cross tracks and roads.	*Moderate* – traffic on existing roads is unlikely to change significantly, but additional roads in mine proximity represent an additional, localised threat.
	Predation interactions with feral cats, feral dogs, foxes (introduced species).	Extent of distribution range of introduced predators.	Long-term	*Low* – given introduced predators are unlikely to significantly increase with suitable monitoring and management.	*High* – it is assumed that introduced predator monitoring and control protocols are well established.
Chuditch Recorded	Habitat loss.	Extent of clearing imposed on core habitat.	Permanent	*High* – core habitat would be cleared during mine and infrastructure construction. Chuditch recorded in study area.	*Moderate* – core habitat is common and widespread in locality.

		Impact			
Species	**Impact Factor**	**Extent**	**Duration**	**Magnitude**	**Certainty**
	Habitat modification through more frequent or higher intensity fires.	Potential extent of bush fire	Short to Long-term	*Low* – may have some effect on foraging areas and prey availability.	*High* – fires as a result of mining operations are not expected and if they occur, suitable emergency response and mitigation measures are in place.
	Vehicle collision.	Expansion of existing road network.	Long-term	*Moderate* – would occur during night production only.	*Moderate* – traffic on existing roads is unlikely to change significantly, but additional roads in mine proximity represent an additional, localised threat.
	Predation interactions with feral cats, feral dogs, foxes (introduced species).	Extent of distribution range of introduced predators.	Long-term	*Low* – introduced predators are unlikely to significantly increase with suitable monitoring and management.	*High* – it is assumed that introduced predator monitoring and control protocols are well established.
	Competition interactions with feral cats, feral dogs, foxes (introduced species).	Extent of suitable breeding habitat.	Long-term	*Low* – introduced competitors are unlikely to significantly increase with suitable monitoring and management.	*High* – it is assumed that introduced competitor monitoring and control protocols are well established.
Schedule 5 species					
Fork-tailed Swift May potentially occur	Habitat loss.	Clearing imposed on foraging habitat.	Permanent	*Low* – species may potentially occur, but not recorded in study area to date.	*High* – species does not breed in Australia
Schedule 6 species					
Red-tailed Phascogale May potentially occur	Habitat loss.	Extent of clearing imposed on suitable habitat.	Permanent	*Moderate* – study area contains suitable habitat, but is widespread and common in locality.	*Moderate* – no records in the study area to date; closest record is 10 km away at Lake Cronin.
	Habitat modification through more frequent or higher intensity fires.	Potential extent of bushfires	Short to Long-term	*Low* – may have some effect on foraging areas and prey availability.	*High* – fires as a result of mining operations are not expected and if they occur, suitable emergency response and mitigation measures are in place.
	Vehicle collision.	Expansion of existing road network.	Long-term	*Moderate* – predominantly arboreal species.	*High* – traffic on existing roads is unlikely to change significantly, but additional roads in mine proximity represent an additional, localised threat.
	Predation interactions with feral cats, feral dogs, foxes (introduced species).	Extent of distribution range of introduced predators.	Long-term	*Low* –introduced predators are unlikely to significantly increase with suitable monitoring and management.	*High* – it is assumed that introduced predator monitoring and control protocols are well established.
Schedule 7 species					
Peregrine Falcon Likely to occur	Habitat loss.	Extent of clearing imposed on core habitat.	Permanent	*Moderate* – may breed in study area but suitable habitat is widespread and common in locality. Species is highly mobile and unless chick is on the nest, would move due to disturbance.	*Moderate* – although uncommon, populations have recovered since DDT impact of the 1970s.

		Impact			
Species	**Impact Factor**	**Extent**	**Duration**	**Magnitude**	**Certainty**
Priority 3 species					
Lake Cronin Snake Likely to occur	Habitat loss.	Extent of clearing imposed on suitable habitat.	Permanent	*Moderate* – known to occur in locality and is likely to occur in the study area.	*Moderate* – given no records to date in the study area. Suitable habitat is widespread and common in locality.
Priority 4 species					
Western Rosella (inland subspecies) Likely to occur	Habitat loss.	Clearing imposed on core habitat.	Permanent	*Moderate* – study area contains many trees with potentially suitable nesting hollows, so impact has potential to be larger than expected.	*Moderate* – may breed in study area. Suitable habitat is widespread and common in locality.
Western Brush Wallaby May potentially occur	Habitat loss.	Clearing imposed on suitable habitat.	Permanent	*Low* – highly mobile species and not dependent on the study area for breeding success.	*High* – given no records in study area. Suitable habitat is widespread and common in locality.
	Vehicle collision.	Expansion of existing road network.	Long-term	*Moderate* – no records in study area.	*High* – traffic on existing roads is unlikely to change significantly, but additional roads in mine proximity represent an additional, localised threat.
Marine listed species					
Black-eared Cuckoo May potentially occur	Habitat loss.	Extent of clearing imposed on core habitat.	Permanent	*Moderate* – may breed in study area.	*Moderate* – study area contains some trees that may house cuckoo host nests.
Rainbow Bee-eater Likely to occur	Habitat loss.	Extent of suitable breeding habitat.	Long-term	*Low* – suitable nesting habitat only present in a small proportion of the study area (heathland).	*High* – unlikely to breed in study area.

7.4 Management Recommendations

Based on the threatening processes known to affect the three MNES species recorded in the study area, and giving consideration to the nature of the proposed development, the following management recommendations apply:

1. If project timing requires clearing to be completed during the Malleefowl or Carnaby's Black-Cockatoo peak breeding season (August to late January and July to November, respectively), then targeted surveys should be conducted prior to commencing.
2. Revision and implementation of the feral animal control management plan to mitigate the risk of predation (cats and foxes) through a continued feral animal-control baiting programme within Western Areas' tenements, specifically the New Morning tenement.
3. Revision and implementation of the fire management plan in relation to the proposed development. This may focus on minimising the spread of fires on a local scale and promote patchier burns if fire does occur. Particular attention should be given to Eucalypt woodland in regards to Carnaby's Black-Cockatoo and to Mallee woodland and shrubland in regards to Malleefowl.
4. In cases where threatened fauna are recorded, it is advisable to refer proposals to the Commonwealth Department of the Environment and Energy (DoEE) to determine if the likely impacts are considered significant.

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8.0 Glossary

Biota	Biota Environmental Sciences.
DBCA	Western Australian Department of Biodiversity, Conservation and Attractions.
DoEE	Commonwealth Department of the Environment and Energy.
EIA	Environmental Impact Assessment.
EPA	Environmental Protection Authority of Western Australia.
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
IBRA	Interim Biogeographic Regionalisation for Australia.
Landform	A geomorphological unit that is largely defined by its surface form and location in the study area.
Lineage	Any continuous line of descent; any series of organisms connected by reproduction by parent of offspring.
Maximum spanning distance	The maximum linear distance between two records.
Minimum spanning area	The area of the smallest polygon that can be drawn around all location records for a taxon. Can be used as a means for objectively establishing SRE status by comparison against the 10,000 km^2 criterion established by Harvey (2002).
MNES species	Species that are listed as Matters of National Environmental Significance under the EPBC Act.
SRE	Short-range endemic.
Taxon (plural: taxa)	A taxonomic entity, typically at species level or below.
WAM	Western Australian Museum.

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Appendix 1

Previous Vertebrate Fauna Records in the Study Area Locality

Amphibians

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Hylidae	*Litoria cyclorhyncha*	Spotted-thighed Frog			X		
Limnodynastidae	*Heleioporus albopunctatus*	Western Spotted Frog			X		
Limnodynastidae	*Limnodynastes dorsalis*	Western Banjo Frog			X		
Limnodynastidae	*Neobatrachus albipes*	White-footed Trilling Frog			X		
Limnodynastidae	*Neobatrachus kunapalari*	Kunapalari Frog			X		
Limnodynastidae	*Neobatrachus pelobatoides*	Humming Frog			X		
Limnodynastidae	*Neobatrachus sutor*	Shoemaker Frog			X		
Myobatrachidae	*Crinia pseudinsignifera*	Bleating Froglet			X		X
Myobatrachidae	*Pseudophryne guentheri*	Crawling Toadlet			X		
Myobatrachidae	*Pseudophryne occidentalis*	Western Toadlet			X		

* (Biota 2006b, 2006a, 2007a, 2007b, 2010)

Reptiles

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Gekkonidae	*Underwoodisaurus milii*	Southern Barking Gecko			X		X
Diplodactylidae	*Crenadactylus ocellatus*	South-western Clawless Gecko			X		X
Diplodactylidae	*Diplodactylus calcicolus*	South Coast Gecko			X		
Diplodactylidae	*Diplodactylus granariensis*	–			X		X
Diplodactylidae	*Diplodactylus pulcher*	–			X		
Diplodactylidae	*Hesperoedura reticulata*	–			X		
Diplodactylidae	*Lucasium maini*	–			X		X
Diplodactylidae	*Strophurus spinigerus*	–			X		X
Gekkonidae	*Gehyra variegata*	–					X
Pygopodidae	*Delma australis*	–			X		
Pygopodidae	*Delma fraseri*	–			X		X
Pygopodidae	*Lialis burtonis*	–			X		
Pygopodidae	*Pygopus lepidopodus*	Common Scaly Foot			X		
Agamidae	*Cryptoblepharus plagiocephalus*	–					X
Agamidae	*Ctenophorus chapmani*	Eastern Heath Dragon			X		
Agamidae	*Ctenophorus cristatus*	Bicycle Dragon			X		
Agamidae	*Ctenophorus maculatus*	Spotted Military Dragon			X		X
Agamidae	*Ctenophorus ornatus*	Ornate Crevice Dragon			X		
Agamidae	*Ctenophorus salinarum*	Salt Pan Dragon			X		
Agamidae	*Moloch horridus*	Thorny Devil			X		

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Agamidae	*Pogona minor*	Western Bearded Dragon			X		X
Scincidae	*Cryptoblepharus buchananii*	–			X		
Scincidae	*Cryptoblepharus plagiocephalus*	–			X		
Scincidae	*Ctenotus atlas*	–			X		
Scincidae	*Ctenotus impar*	–			X		
Scincidae	*Ctenotus schomburgkii*	–			X		X
Scincidae	*Cyclodomorphus melanops*	Slender Blue-tongue			X		
Scincidae	*Egernia richardi*	–			X		
Scincidae	*Hemiergis initialis*	–			X		X
Scincidae	*Hemiergis peronii*	–			X		
Scincidae	*Lerista distinguenda*	–			X		
Scincidae	*Lerista picturata*	–			X		X
Scincidae	*Liopholis inornata*	–			X		
Scincidae	*Liopholis multiscutata*	–			X		X
Scincidae	*Menetia greyii*	–			X		
Scincidae	*Morethia butleri*	–			X		
Scincidae	*Morethia obscura*	–			X		X
Scincidae	*Tiliqua occipitalis*	Western Bluetongue			X		
Scincidae	*Tiliqua rugosa*	–			X		
Varanidae	*Varanus gouldii*	Bungarra or Sand Goanna			X		
Varanidae	*Varanus rosenbergi*	Heath Goanna					X
Boidae	*Morelia spilota*	Carpet Python			X		
Elapidae	*Echiopsis curta*	Bardick			X		
Elapidae	*Neelaps bimaculatus*	Black-naped Snake			X		
Elapidae	*Parasuta gouldii*	–			X		X
Elapidae	*Parasuta nigriceps*	–			X		
Elapidae	*Paroplocephalus atriceps*	Lake Cronin Snake	P3		X		
Elapidae	*Pseudechis australis*	Mulga Snake			X		
Elapidae	*Pseudonaja affinis*	Dugite			X		X
Elapidae	*Pseudonaja nuchalis*	Gwardar; Northern Brown Snake			X		
Elapidae	*Simoselaps bertholdi*	Jan's Banded Snake			X		

* (Biota 2006b, 2006a, 2007a, 2007b, 2010)

Avifauna

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Casuariidae	*Dromaius novaehollandiae*	Emu			X		X
Megapodiidae	*Leipoa ocellata*	Malleefowl	Schedule 3	Vulnerable	X	X	X
Anatidae	*Biziura lobata*	Musk Duck			X		
Anatidae	*Stictonetta naevosa*	Freckled Duck			X		
Anatidae	*Cygnus atratus*	Black Swan			X		
Anatidae	*Tadorna tadornoides*	Australian Shelduck			X		X
Anatidae	*Chenonetta jubata*	Australian Wood Duck			X		
Anatidae	*Malacorhynchus membranaceus*	Pink-eared Duck			X		
Anatidae	*Anas rhynchotis*	Australasian Shoveler			X		
Anatidae	*Anas gracilis*	Grey Teal			X		X
Anatidae	*Anas castanea*	Chestnut Teal			X		
Anatidae	*Anas superciliosa*	Pacific Black Duck			X		X
Anatidae	*Aythya australis*	Hardhead			X		
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe			X		
Podicipedidae	*Poliocephalus poliocephalus*	Hoary-headed Grebe			X		
Podicipedidae	*Podiceps cristatus*	Great Crested Grebe			X		
Columbidae	*Phaps chalcoptera*	Common Bronzewing			X		X
Columbidae	*Phaps elegans*	Brush Bronzewing			X		X
Columbidae	*Ocyphaps lophotes*	Crested Pigeon			X		
Podargidae	*Podargus strigoides*	Tawny Frogmouth			X		X
Caprimulgidae	*Eurostopodus argus*	Spotted Nightjar			X		X
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar			X		
Apodidae	*Apus pacificus*	Fork-tailed Swift	Schedule 5	Migratory / Marine	X		
Ardeidae	*Ardea pacifica*	White-necked Heron			X		X
Ardeidae	*Ardea modesta*	Eastern Great Egret		Marine		X	
Ardeidae	*Ardea ibis*	Cattle Egret		Marine		X	
Ardeidae	*Nycticorax caledonicus*	Nankeen Night-Heron			X		
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis			X		
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill					X
Accipitridae	*Accipiter fasciatus*	Brown Goshawk			X		
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk			X		X
Accipitridae	*Aquila audax*	Wedge-tailed Eagle			X		X
Accipitridae	*Hieraaetus morphnoides*	Little Eagle			X		
Falconidae	*Falco cenchroides*	Nankeen Kestrel			X		
Falconidae	*Falco berigora*	Brown Falcon			X		X

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Falconidae	*Falco longipennis*	Australian Hobby			X		
Falconidae	*Falco peregrinus*	Peregrine Falcon	Schedule 7		X		X
Rallidae	*Tribonyx ventralis*	Black-tailed Native-hen			X		
Rallidae	*Fulica atra*	Eurasian Coot			X		
Otididae	*Ardeotis australis*	Australian Bustard			X		
Charadriidae	*Charadrius ruficapillus*	Red-capped Plover			X		
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel			X		
Charadriidae	*Thinornis rubricollis*	Hooded Plover	P4	Marine	X	X	
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Schedule 5	Migratory/Marine		X	
Scolopacidae	*Tringa nebularia*	Common Greenshank	Schedule 5	Migratory/Marine		X	
Scolopacidae	*Calidris melanotos*	Pectoral Sandpiper	Schedule 5	Migratory/Marine		X	
Scolopacidae	*Calidris acuminata*	Sharp-tailed Sandpiper	Schedule 5	Migratory	X		
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper	Schedule 3; Schedule 5	Critically Endangered / Migratory / Marine		X	
Turnicidae	*Turnix velox*	Little Button-quail			X		
Psittacidae	*Calyptorhynchus latirostris*	Carnaby's Black-Cockatoo	Schedule 2	Endangered	X		
Cacatuidae	*Eolophus roseicapillus*	Galah					X
Psittacidae	*Nymphicus hollandicus*	Cockatiel			X		
Psittacidae	*Glossopsitta porphyrocephala*	Purple-crowned Lorikeet					X
Psittacidae	*Polytelis anthopeplus*	Regent Parrot			X		X
Psittacidae	*Platycercus icterotis*	Western Rosella	P4		X		X
Psittacidae	*Barnardius zonarius*	Australian Ringneck			X		X
Psittacidae	*Psephotus varius*	Mulga Parrot			X		
Psittacidae	*Melopsittacus undulatus*	Budgerigar			X		
Psittacidae	*Neophema elegans*	Elegant Parrot			X		
Psittacidae	*Pezoporus occidentalis*	Night Parrot	Schedule 1	Endangered		X	
Cuculidae	*Chalcites lucidus*	Shining Bronze Cuckoo					X
Cuculidae	*Chalcites osculans*	Black-eared Cuckoo		Marine		X	
Cuculidae	*Cacomantis pallidus*	Pallid Cuckoo			X		
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo			X		X
Halcyonidae	*Todiramphus pyrrhopygius*	Red-backed Kingfisher			X		
Halcyonidae	*Todiramphus sanctus*	Sacred Kingfisher			X		
Meropidae	*Merops ornatus*	Rainbow Bee-eater		Marine	X	X	
Maluridae	*Malurus splendens*	Splendid Fairy-wren			X		
Maluridae	*Malurus leucopterus*	White-winged Fairy-wren	Schedule 3		X		
Maluridae	*Malurus pulcherrimus*	Blue-breasted Fairy-wren			X		X

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Maluridae	*Stipiturus malachurus*	Southern Emu-wren	Schedule 3		X		X
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren			X		
Acanthizidae	*Calamanthus cautus*	Shy Heathwren			X		X
Acanthizidae	*Calamanthus campestris*	Rufous Fieldwren	Schedule 3		X		X
Acanthizidae	*Pyrrholaemus brunneus*	Redthroat			X		X
Acanthizidae	*Smicrornis brevirostris*	Weebill			X		X
Acanthizidae	*Gerygone fusca*	Western Gerygone			X		X
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill			X		X
Acanthizidae	*Acanthiza uropygialis*	Chestnut-rumped Thornbill			X		X
Acanthizidae	*Acanthiza inornata*	Western Thornbill			X		
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill			X		X
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote			X		X
Pardalotidae	*Pardalotus striatus*	Striated Pardalote			X		X
Meliphagidae	*Certhionyx variegatus*	Pied Honeyeater			X		
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater					X
Meliphagidae	*Lichenostomus leucotis*	White-eared Honeyeater			X		X
Meliphagidae	*Lichenostomus cratitius*	Purple-gaped Honeyeater			X		X
Meliphagidae	*Lichenostomus plumulus*	Grey-fronted Honeyeater					X
Meliphagidae	*Lichenostomus penicillatus*	Yellow-plumed Honeyeater					X
Meliphagidae	*Purnella albifrons*	White-fronted Honeyeater			X		X
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner			X		
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater			X		X
Meliphagidae	*Anthochaera lunulata*	Western Wattlebird			X		
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird			X		X
Meliphagidae	*Epthianura albifrons*	White-fronted Chat			X		
Meliphagidae	*Glyciphila melanops*	Tawny-crowned Honeyeater			X		X
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater			X		X
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater			X		X
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater			X		X
Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater			X		X
Pomatostomidae	*Pomatostomus superciliosus*	White-browed Babbler			X		
Eupetidae	*Cinclosoma castanotum*	Chestnut Quail-thrush					X
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella			X		X
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			X		X
Pachycephalidae	*Falcunculus frontatus*	Crested Shrike-tit	P4		X		
Pachycephalidae	*Pachycephala inornata*	Gilbert's Whistler			X		

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler					X
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler			X		
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush			X		X
Pachycephalidae	*Oreoica gutturalis*	Crested Bellbird			X		X
Artamidae	*Artamus personatus*	Masked Woodswallow			X		
Artamidae	*Artamus cinereus*	Black-faced Woodswallow			X		
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow			X		X
Cracticidae	*Cracticus torquatus*	Grey Butcherbird			X		X
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird			X		X
Cracticidae	*Cracticus tibicen*	Australian Magpie			X		X
Cracticidae	*Strepera versicolor*	Grey Currawong			X		X
Dicruridae	*Rhipidura albiscapa*	Grey Fantail			X		X
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail			X		X
Corvidae	*Corvus coronoides*	Australian Raven			X		X
Corvidae	*Corvus bennetti*	Little Crow			X		
Corvidae	*Corvus orru*	Torresian Crow			X		
Dicruridae	*Myiagra inquieta*	Restless Flycatcher			X		
Dicruridae	*Grallina cyanoleuca*	Magpie-lark			X		
Petroicidae	*Microeca fascinans*	Jacky Winter			X		X
Petroicidae	*Petroica goodenovii*	Red-capped Robin			X		
Petroicidae	*Melanodryas cucullata*	Hooded Robin			X		X
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin			X		
Petroicidae	*Eopsaltria griseogularis*	Western Yellow Robin					X
Petroicidae	*Drymodes brunneopygia*	Southern Scrub-robin			X		X
Zosteropidae	*Zosterops lateralis*	Silvereye			X		X
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow			X		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow			X		
Hirundinidae	*Petrochelidon ariel*	Fairy Martin			X		
Hirundinidae	*Petrochelidon nigricans*	Tree Martin			X		X
Estrildidae	*Taeniopygia guttata*	Zebra Finch			X		
Motacillidae	*Anthus novaeseelandiae*	Australasian Pipit					X
Motacillidae	*Anthus cervinus*	Red-throated Pipit			X		
Motacillidae	*Motacilla cinerea*	Grey Wagtail	Schedule 5	Migratory/Marine		X	

* (Biota 2006b, 2006a, 2007a, 2007b, 2010)

Mammals

Family	Species Name	Common Name	Conservation Significance		NatureMap	EPBC Act	Previous Surveys*
			State	Commonwealth			
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			X		X
Dasyuridae	*Dasyurus geoffroii*	Western Quoll, Chuditch	Schedule 3	Vulnerable	X		X
Dasyuridae	*Ningaui yvonneae*	Southern Ningaui			X		
Dasyuridae	*Phascogale calura*	Red-tailed Phascogale	Schedule 6	Vulnerable		X	
Dasyuridae	*Sminthopsis crassicaudata*	Fat-tailed Dunnart			X		X
Dasyuridae	*Sminthopsis gilberti*	Gilbert's Dunnart			X		
Dasyuridae	*Sminthopsis granulipes*	White-tailed Dunnart			X		X
Burramyidae	*Cercartetus concinnus*	Western Pygmy-possum, Mundarda			X		X
Tarsipedidae	*Tarsipes rostratus*	Honey Possum, Noolbenger					X
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo			X		X
Macropodidae	*Notamacropus irma*	Western Brush Wallaby	P4		X		X
Muridae	*Mus musculus*	House Mouse			X		X
Muridae	*Notomys mitchellii*	Mitchell's Hopping-mouse			X		X
Muridae	*Pseudomys albocinereus*	Ash-grey Mouse			X		
Muridae	*Pseudomys occidentalis*	Western Mouse	P4		X		
Leporidae	*Oryctolagus cuniculus*	Rabbit			X		X
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat			X		
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat			X		X
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat			X		
Vespertilionidae	*Vespadelus regulus*	Southern Forest-bat			X		X
Canidae	*Canis lupus*	Dog			X		X
Canidae	*Vulpes vulpes*	Red Fox			X		X
Felidae	*Felis catus*	Cat			X		X

* (Biota 2006b, 2006a, 2007a, 2007b, 2010)

Appendix 2

Threatened Fauna Statutory Framework – Western Australia

Commonwealth *EPBC Act 1999*

Fauna species of national environmental significance are listed under the Commonwealth *EPBC Act*, and may be classified as 'critically endangered', 'endangered', 'vulnerable' or 'lower risk', which are consistent with IUCN categories.

Critically Endangered (CR): a taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

Endangered (EN): a taxon is Endangered when it is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

Vulnerable (VU): a taxon is Vulnerable when it is not Critically Endangered or Endangered but is facing a high risk of extinction in the wild in the medium-term future.

Lower Risk (LR): a taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1. **Conservation Dependent (CD).** Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.
2. **Near Threatened (NT).** Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.
3. **Least Concern (LC).** Taxa which do not qualify for Conservation Dependent or Near Threatened.

Migratory species are also protected under the *EPBC Act* as species of national environmental significance. Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. The list of migratory species consists of those species listed under the following international conventions:

1. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
2. China-Australia Migratory Bird Agreement (CAMBA);
3. Japan-Australia Migratory Bird Agreement (JAMBA); and,
4. Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Marine species are also protected under the *EPBC Act*, and are listed to ensure the long-term conservation of the species. Marine species include all Australian sea snakes, seals, crocodiles, dugongs, marine turtles, seahorses and seabirds that naturally occur in the Commonwealth marine area.

Western Australian *Biodiversity Conservation Act 2016*

Classification of rare and endangered fauna under the state *Wildlife Conservation (Specially Protected Fauna) Notice 2018*[3], recognises seven distinct schedules of taxa:

Schedule 1: fauna that are rare or likely to become extinct as critically endangered fauna (CR).

Schedule 2: fauna that are rare or likely to become extinct as endangered fauna (EN).

Schedule 3: fauna that are rare or likely to become extinct as vulnerable fauna (VU).

Schedule 4: fauna presumed to be extinct (EX).

Schedule 5: birds that are subject to an agreement between the government of Australia and the governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, and birds in danger of extinction, which are declared to be fauna in need of special protection.

[3] The September 2018 *Notice* was issued under the *Wildlife Conservation Act 1950*, which was repealed on 1st January 2019. However an updated gazetted notice has not yet been issued under the *Biodiversity Conservation Act 2016*.

Schedule 6: fauna that is of special conservation need as conservation dependent fauna (CD). This category of species contains those taxa that do not meet the criteria for listing as threatened, but which are being maintained by specific management programs.

Schedule 7: Other specially protected fauna (OS). This category contains those taxa that are at risk from harvesting, or other human interactions, which have potential to affect their conservation status if not appropriately managed.

Department of Biodiversity, Conservation and Attractions

In addition, the DBCA maintains a list of Priority species that have not been assigned statutory protection under the *Biodiversity Conservation Act 2016*. Species on this list are considered to be of conservation priority because there is insufficient information to make an assessment of their conservation status or they are considered to be rare but not threatened and are in need of monitoring. Under this list, species are classified according to five Priority categories:

Priority One: Taxa with few, poorly known populations on threatened lands
Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Two: Taxa with few, poorly known populations on conservation lands
Taxa that are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three: Taxa with several, poorly known populations, some on conservation lands
Taxa that are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four: Taxa in need of monitoring
Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

Priority Five: Taxa in need of monitoring
Taxa that are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Appendix 3

Potential SREs in the Study Area Locality

Family	Class / Taxon Name	Source of Record: Nature Map	EPBC Act	WAM	SRE Status	Distribution and Habitat in Search Locality	Suitable Habitat Available in Study Area?	Likelihood of Occurrence in Study Area: Prior to Survey	Following Survey
Mygalomorph Spiders									
Actinopodidae	*Missulena* `MYG042`			✔	Potential SRE	Recorded 30 km S of study area in heath on sandplain.	✔	May potentially occur	May potentially occur
	Missulena pinguipes			✔	Not an SRE	Recorded on four occasions 30 km S of study area in heath on sandplain.	✔	May potentially occur	May potentially occur
Barychelidae	*Idiommata `yelbeni`*			✔	Not an SRE	Recorded 8 km SE of study area in undetermined habitat, on clay-loam soil.	Indet.	May potentially occur	May potentially occur
	Synothele `forrestiana`			✔	Not an SRE	Recorded 5.7 km NE of study area in mallee eucalypt habitat, on clay-loam soil.	✔	Likely to occur	Likely to occur
	Synothele longbottomi	✔		✔	Not an SRE	Recorded 5.7 km NE of study area in mallee habitat on clay-loam soil. Known from four records distributed from Albion Downs (near Leinster) to Perth in the west and Forrestania in the east. Recorded in a variety of habitats.	✔	Likely to occur	Likely to occur
Ctenezidae	*Conothele* `MYG059`			✔	Not an SRE	Recorded 6.4 km NE of study area in mallee eucalypt habitat, and 9.8 km SE of study area. Both records from clay-loam soil.	✔	Likely to occur	May potentially occur
Idiopidae	*Eucanippe agastachys*			✔	Not an SRE	Single record from 29 km SW of study area, on saline loamy clay adjacent to salt lake.	**x**	Unlikely to occur	Unlikely to occur
	Eucanippe mallee			✔	Potential SRE	Single record from 53 km SW of study area, on sand-loam adjacent to agricultural land.	**x**	Unlikely to occur	Unlikely to occur
	Gaius `cooperi`			✔	Not an SRE	Recorded on three occasions within 45 km of study area. Records located adjacent to salt lakes and on cleared farmland.	**x**	Unlikely to occur	Unlikely to occur
	Gaius `MYG063`			✔	Potential SRE	Recorded on 10 occasions at three locations ~10 km NE of study area, adjacent to salt lakes.	**x**	Unlikely to occur	Unlikely to occur
	Gaius `villosus`				Not an SRE	Single record 37 km SW of study area, from saline loamy clay adjacent to salt lake.	**x**	Unlikely to occur	Unlikely to occur
	Idiosoma `MYG064`			✔	Potential SRE	Recorded on 50 occasions in different vegetation units in the locality, including inside the study area; mainly recorded on clay-loam soil, but also on sand-loam.	✔	Recorded	Recorded
	Idiosoma `MYG065`			✔	Potential SRE	Recorded on 39 occasions in different vegetation units in the locality, including inside the study area; mainly recorded on clay-loam soil, but also on sand-loam.	✔	Recorded	Recorded
Nemesiidae	*Aname* `MYG010`			✔	Not an SRE	Recorded on 24 occasions within heath on sand-loam and *Eucalyptus* woodland on clay-loam.	✔	Likely to occur	Likely to occur
	Aname `MYG181`			✔	Not an SRE	Recorded on two occasions at separate locations approximately 5 km SE of study area. Habitat included heath on sand-loam and *Eucalyptus* woodland on clay-loam.	✔	Likely to occur	Likely to occur
	Aname `MYG182`			✔	Potential SRE	Recorded on two occasions at separate locations up to 13 km S of the study area. Habitat included heath on sandplain and *Melaleuca* tall shrubs on loam.	✔	Likely to occur	Likely to occur
	Aname `MYG461`			✔	Potential SRE	Recorded approximately 10 km NE of study area at the Lake Cronin Nature Reserve.	Indet.	May potentially occur	May potentially occur
	Aname mainae	✔		✔	Not an SRE	Recorded in heath in the locality; is documented as a habitat generalist.	✔	Likely to occur	Likely to occur
	Kwonkan `MYG060`			✔	Not an SRE	Recorded at a single location approximately 5 km NE of study area, in mallee vegetation on loam soil.	✔	Likely to occur	Likely to occur
	Kwonkan `MYG183`			✔	Not an SRE	Recorded at a single location approximately 6 km SE of study area, in mallee vegetation on loam soil.	✔	Likely to occur	Likely to occur
	Merredinia damsonoides	✔		✔	Not an SRE	Recorded at three locations on clay loam soils in the locality.	✔	Likely to occur	Likely to occur
	Teyl `MYG068`			✔	Potential SRE	Recorded at a single location ~28 km S of study area, in open eucalypt woodland on clay-loam soil.	✔	May potentially occur	May potentially occur
Millipedes									
Paradoxosomatidae	*Antichiropus exclamatus*			✔	Not an SRE	Recorded at a single location ~26 km N of study area, on clay-loam soil.	✔	May potentially occur	Recorded
Land Snails									
Bothriembryontidae	*Bothriembryon* `Lake Cronin` n. sp.				Potential SRE	Recorded at two locations (7 km NE and 23 km N of study area), in clay-loam soil and sand-loam respectively.	✔	Likely to occur	Likely to occur

Indet. = indeterminate

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Appendix 4

Carnaby's Black-Cockatoo Breeding Habitat Trees

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
8	2018-08-29	*E. salmonophloia*	Nesting			751907	6405908	38	15-20	Alive	
9	2018-08-29	*E. urna*	Nesting			751727	6406024	40	10-15	Alive	
10	2018-08-30	*E. salmonophloia*	Nesting			751352	6404601	32	10-15	Alive	
11	2018-08-30	*E. salmonophloia*	Nesting			751323	6404585	32	0-10	Alive	
12	2018-08-31	*E. salmonophloia*	Nesting			751087	6405757	42	10-15	Alive	
13	2018-08-31	*E. salmonophloia*	Nesting			751296	6405806	40	10-15	Alive	
14	2018-08-31	E. salmonophloia	Nesting	Yes		750852	6405685	53	10-15	Alive	
15	2018-08-31	*E. salmonophloia*	Nesting			751278	6404768	30	10-15	Alive	
16	2018-08-31	*E. salmonophloia*	Nesting			751287	6404781	40	10-15	Alive	
17	2018-09-02	*E. salmonophloia*	Nesting			750502	6406503	42	10-15	Alive	
18	2018-09-02	*E. urna*	Nesting			751305	6406519	38	10-15	Alive	
19	2018-09-03	*E. salmonophloia*	Nesting			753708	6403093	32	10-15	Alive	
20	2018-09-03	Indet. Stag	Nesting	Yes		753714	6403764	55	0-10	Dead	
21	2018-09-03	Indet. Stag	Nesting	Yes		753721	6403989	45	0-10	Dead	
22	2018-09-03	Indet. Stag	Nesting			751203	6405273	30	0-10	Dead	
23	2018-09-01	*E. salmonophloia*	Nesting			750774	6406378	41	10-15	Resprouting (fire)	
24	2018-09-02	*E. urna*	Nesting			751156	6406539	34	10-15	Resprouting (fire)	
25	2018-09-02	*E. salmonophloia*	Nesting			750954	6406513	32	0-10	Resprouting (fire)	
26	2018-09-02	*E. longicornis*	Nesting	Yes		750508	6406638	54	10-15	Resprouting (fire)	
27	2018-09-03	*E. urna*	Nesting	Yes		751545	6405266	60	10-15	Resprouting (fire)	
28	2018-08-31	*E. salmonophloia*	Nesting	Yes		750900	6405680	69	10-15	Stressed	
29	2018-08-31	*E. urna*	Nesting	Yes		751174	6406005	32	0-10	Alive	Chewing
30	2018-08-30	Indet. Stag	Nesting	Yes		751744	6406608	31	0-10	Dead	Chewing
31	2018-08-31	*E. urna*	Nesting	Yes		751590	6405881	40	0-10	Resprouting (fire)	Chewing
32	2018-08-29	*E. salmonophloia*	Nesting	Yes		751870	6405917	84	10-15	Alive	Chewing, scarring
33	2018-08-30	*E. salmonophloia*	Nesting	Yes		751551	6404472	55	0-10	Stressed	Chewing, scarring, scratch marks
34	2018-08-29	*E. salmonophloia*	Nesting			752053	6406141	59	10-15	Alive	Chewing, wear
35	2018-08-29	*E. salmonophloia*	Nesting			751861	6405851	52	15-20	Alive	
37	2018-08-29	*E. salmonophloia*	Nesting			751788	6405736	68	25+	Alive	
38	2018-08-29	*E. urna*	Nesting			751786	6405699	49	15-20	Alive	
39	2018-08-29	*E. urna*	Nesting			751762	6405557	36	15-20	Alive	
40	2018-08-29	*E. urna*	Nesting			752074	6405437	45	15-20	Alive	
41	2018-08-29	*E. urna*	Nesting	Yes		751957	6405762	45	15-20	Alive	
42	2018-08-29	*E. urna*	Nesting	Yes		751806	6405748	73	15-20	Alive	
43	2018-08-29	*E. urna*	Nesting			751789	6405689	51	15-20	Alive	
44	2018-08-29	*E. urna*	Nesting			751978	6405437	35	10-15	Alive	
45	2018-08-29	*E. urna*	Nesting			751986	6405641	47	10-15	Alive	
46	2018-08-29	*E. urna*	Nesting			752094	6405494	38	10-15	Alive	
47	2018-08-29	*E. urna*	Nesting	Yes		752100	6405490	76	20-25	Alive	
48	2018-08-29	*E. salmonophloia*	Nesting	Yes		751885	6405954	59	10-15	Alive	
49	2018-08-29	*E. salmonophloia*	Nesting			751818	6405920	34	10-15	Alive	
50	2018-08-29	*E. salmonophloia*	Nesting			751909	6405918	42	10-15	Alive	
51	2018-08-29	*E. salmonophloia*	Nesting			751969	6406001	56	10-15	Alive	
52	2018-08-29	*E. salmonophloia*	Nesting			751802	6405996	35	15-20	Alive	
53	2018-08-29	*E. urna*	Nesting			751727	6406009	33	10-15	Alive	
54	2018-08-29	*E. salmonophloia*	Nesting			751809	6406026	41	15-20	Alive	
55	2018-08-29	*E. salmonophloia*	Nesting			751696	6406121	39	10-15	Alive	
56	2018-08-30	*E. urna*	Nesting			752064	6406507	38	0-10	Alive	
57	2018-08-30	*E. salmonophloia*	Nesting			751710	6406492	49	0-10	Alive	
58	2018-08-30	*E. urna*	Nesting			751703	6406477	31	0-10	Alive	
59	2018-08-30	*E. salmonophloia*	Nesting	Yes		751923	6406369	60	0-10	Alive	
60	2018-08-30	*E. urna*	Nesting			752106	6406326	47	10-15	Alive	
61	2018-08-30	*E. salmonophloia*	Nesting			752090	6406277	39	10-15	Alive	
62	2018-08-30	*E. urna*	Nesting	Yes		751954	6406466	46	10-15	Alive	
63	2018-08-30	*E. salmonophloia*	Nesting	Yes		751905	6406355	41	0-10	Alive	
64	2018-08-30	*E. urna*	Nesting			752112	6406345	30	10-15	Alive	
65	2018-08-30	*E. urna*	Nesting			752136	6406341	36	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
66	2018-08-30	*E. salmonophloia*	Nesting			751571	6404469	39	0-10	Alive	
67	2018-08-30	*E. salmonophloia*	Nesting			751554	6404463	36	10-15	Alive	
68	2018-08-30	*E. salmonophloia*	Nesting			751515	6404465	40	10-15	Alive	
69	2018-08-30	*E. salmonophloia*	Nesting			751415	6404465	49	0-10	Alive	
70	2018-08-30	*E. salmonophloia*	Nesting			751363	6404470	36	0-10	Alive	
71	2018-08-30	*E. salmonophloia*	Nesting			751330	6404488	41	10-15	Alive	
72	2018-08-30	*E. salmonophloia*	Nesting			751333	6404486	33	0-10	Alive	
73	2018-08-30	*E. salmonophloia*	Nesting			751294	6404472	38	0-10	Alive	
74	2018-08-30	*E. salmonophloia*	Nesting			751272	6404460	39	0-10	Alive	
75	2018-08-30	*E. salmonophloia*	Nesting			751416	6404553	41	10-15	Alive	
76	2018-08-30	*E. salmonophloia*	Nesting			751452	6404567	38	0-10	Alive	
77	2018-08-30	*E. salmonophloia*	Nesting			751558	6404582	51	0-10	Alive	
78	2018-08-30	*E. salmonophloia*	Nesting			751456	6404589	66	10-15	Alive	
79	2018-08-30	*E. salmonophloia*	Nesting			751419	6404584	55	0-10	Alive	
80	2018-08-30	*E. salmonophloia*	Nesting			751394	6404565	38	0-10	Alive	
81	2018-08-30	*E. salmonophloia*	Nesting			751377	6404580	39	10-15	Alive	
82	2018-08-30	*E. salmonophloia*	Nesting			751363	6404555	89	10-15	Alive	
83	2018-08-30	*E. salmonophloia*	Nesting			751286	6404556	32	0-10	Alive	
84	2018-08-30	*E. salmonophloia*	Nesting			751304	6404684	39	10-15	Alive	
85	2018-08-30	*E. salmonophloia*	Nesting			751415	6404686	33	10-15	Alive	
86	2018-08-30	*E. salmonophloia*	Nesting			751472	6404694	32	10-15	Alive	
87	2018-08-30	*E. salmonophloia*	Nesting			751562	6404490	34	10-15	Alive	
88	2018-08-30	*E. salmonophloia*	Nesting			751550	6404491	41	10-15	Alive	
89	2018-08-30	*E. salmonophloia*	Nesting			751529	6404488	32	0-10	Alive	
90	2018-08-30	*E. salmonophloia*	Nesting			751446	6404484	45	10-15	Alive	
91	2018-08-30	*E. salmonophloia*	Nesting			751389	6404494	41	10-15	Alive	
92	2018-08-30	*E. salmonophloia*	Nesting			751388	6404494	43	10-15	Alive	
93	2018-08-30	*E. salmonophloia*	Nesting			751387	6404499	39	10-15	Alive	
94	2018-08-30	*E. salmonophloia*	Nesting			751363	6404491	36	10-15	Alive	
95	2018-08-30	*E. salmonophloia*	Nesting			751324	6404501	42	10-15	Alive	
96	2018-08-30	*E. salmonophloia*	Nesting			751301	6404503	40	0-10	Alive	
97	2018-08-30	*E. salmonophloia*	Nesting			751291	6404483	33	0-10	Alive	
98	2018-08-30	*E. salmonophloia*	Nesting			751260	6404470	39	10-15	Alive	
99	2018-08-30	*E. salmonophloia*	Nesting			751236	6404463	50	10-15	Alive	
100	2018-08-30	*E. salmonophloia*	Nesting			751249	6404503	37	10-15	Alive	
101	2018-08-30	*E. salmonophloia*	Nesting			751372	6404552	88	10-15	Alive	
102	2018-08-30	*E. salmonophloia*	Nesting			751445	6404546	47	10-15	Alive	
103	2018-08-30	*E. salmonophloia*	Nesting			751437	6404547	46	10-15	Alive	
104	2018-08-30	*E. salmonophloia*	Nesting			751486	6404554	32	10-15	Alive	
105	2018-08-30	*E. salmonophloia*	Nesting			751552	6404588	66	10-15	Alive	
106	2018-08-30	*E. salmonophloia*	Nesting	Yes		751515	6404619	91	10-15	Alive	
107	2018-08-30	*E. salmonophloia*	Nesting			751469	6404610	35	0-10	Alive	
108	2018-08-30	*E. salmonophloia*	Nesting			751456	6404612	42	10-15	Alive	
109	2018-08-30	*E. salmonophloia*	Nesting			751404	6404585	38	0-10	Alive	
110	2018-08-30	*E. salmonophloia*	Nesting			751385	6404589	42	10-15	Alive	
111	2018-08-30	*E. salmonophloia*	Nesting			751421	6404608	33	0-10	Alive	
112	2018-08-30	*E. salmonophloia*	Nesting			751375	6404587	33	10-15	Alive	
113	2018-08-30	*E. salmonophloia*	Nesting			751340	6404564	37	10-15	Alive	
114	2018-08-30	*E. salmonophloia*	Nesting			751328	6404570	36	10-15	Alive	
115	2018-08-30	*E. salmonophloia*	Nesting			751336	6404548	41	10-15	Alive	
116	2018-08-30	*E. salmonophloia*	Nesting			751285	6404569	36	0-10	Alive	
117	2018-08-30	*E. salmonophloia*	Nesting			751290	6404673	33	0-10	Alive	
118	2018-08-30	*E. salmonophloia*	Nesting			751293	6404678	32	0-10	Alive	
119	2018-08-30	*E. salmonophloia*	Nesting			751355	6404673	36	0-10	Alive	
120	2018-08-30	*E. salmonophloia*	Nesting			751404	6404680	35	0-10	Alive	
121	2018-08-30	*E. salmonophloia*	Nesting			751413	6404678	36	10-15	Alive	
122	2018-08-30	*E. salmonophloia*	Nesting			751472	6404680	31	0-10	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
123	2018-08-30	*E. transcontinentalis*	Nesting			751639	6404677	42	10-15	Alive	
124	2018-08-30	*E. salmonophloia*	Nesting			751551	6404501	41	10-15	Alive	
125	2018-08-30	*E. salmonophloia*	Nesting			751520	6404464	53	15-20	Alive	
126	2018-08-30	*E. salmonophloia*	Nesting			751535	6404505	46	10-15	Alive	
127	2018-08-30	*E. salmonophloia*	Nesting			751454	6404502	30	15-20	Alive	
128	2018-08-30	*E. salmonophloia*	Nesting			751445	6404510	42	10-15	Alive	
129	2018-08-30	*E. salmonophloia*	Nesting			751377	6404512	75	15-20	Alive	
130	2018-08-30	*E. salmonophloia*	Nesting			751379	6404511	60	15-20	Alive	
131	2018-08-30	*E. salmonophloia*	Nesting			751323	6404512	33	10-15	Alive	
132	2018-08-30	*E. salmonophloia*	Nesting			751253	6404495	31	10-15	Alive	
133	2018-08-30	*E. salmonophloia*	Nesting			751272	6404503	31	10-15	Alive	
134	2018-08-30	*E. salmonophloia*	Nesting			751442	6404550	33	15-20	Alive	
135	2018-08-30	*E. salmonophloia*	Nesting			751482	6404555	31	15-20	Alive	
136	2018-08-30	*E. salmonophloia*	Nesting			751478	6404544	54	15-20	Alive	
137	2018-08-30	*E. salmonophloia*	Nesting	Yes		751550	6404607	79	15-20	Alive	
138	2018-08-30	*E. salmonophloia*	Nesting			751531	6404610	40	10-15	Alive	
139	2018-08-30	*E. salmonophloia*	Nesting			751451	6404603	40	10-15	Alive	
140	2018-08-30	*E. salmonophloia*	Nesting			751424	6404614	41	15-20	Alive	
141	2018-08-30	*E. salmonophloia*	Nesting			751408	6404611	41	10-15	Alive	
142	2018-08-30	*E. salmonophloia*	Nesting			751388	6404600	35	0-10	Alive	
143	2018-08-30	*E. salmonophloia*	Nesting			751325	6404574	41	10-15	Alive	
144	2018-08-30	*E. salmonophloia*	Nesting			751302	6404558	35	0-10	Alive	
145	2018-08-30	*E. salmonophloia*	Nesting			751302	6404640	32	10-15	Alive	
146	2018-08-30	*E. salmonophloia*	Nesting			751320	6404670	45	10-15	Alive	
147	2018-08-30	*E. salmonophloia*	Nesting			751408	6404667	47	10-15	Alive	
148	2018-08-30	*E. salmonophloia*	Nesting			751435	6404667	40	10-15	Alive	
149	2018-08-31	*E. salmonophloia*	Nesting			750745	6405999	38	0-10	Alive	
150	2018-08-31	*E. salmonophloia*	Nesting			750975	6406002	38	10-15	Alive	
151	2018-08-31	*E. urna*	Nesting	Yes		751023	6406003	38	0-10	Alive	
152	2018-08-31	*E. urna*	Nesting			751067	6406001	36	0-10	Alive	
153	2018-08-31	*E. urna*	Nesting			751312	6405986	38	10-15	Alive	
154	2018-08-31	*E. urna*	Nesting			751337	6405995	34	0-10	Alive	
155	2018-08-31	*E. urna*	Nesting	Yes		751424	6405997	38	0-10	Alive	
156	2018-08-31	*E. urna*	Nesting			751615	6405927	33	0-10	Alive	
157	2018-08-31	*E. urna*	Nesting			751579	6405915	39	0-10	Alive	
158	2018-08-31	*E. urna*	Nesting			751550	6405917	33	0-10	Alive	
159	2018-08-31	*E. urna*	Nesting			751486	6405942	35	0-10	Alive	
160	2018-08-31	*E. urna*	Nesting			751389	6405946	39	0-10	Alive	
161	2018-08-31	*E. urna*	Nesting			751375	6405945	33	10-15	Alive	
162	2018-08-31	*E. urna*	Nesting			751373	6405945	34	10-15	Alive	
163	2018-08-31	*E. urna*	Nesting			751173	6405929	38	0-10	Alive	
164	2018-08-31	*E. salmonophloia*	Nesting			751033	6405886	34	10-15	Alive	
165	2018-08-31	*E. salmonophloia*	Nesting			751031	6405883	39	0-10	Alive	
166	2018-08-31	*E. salmonophloia*	Nesting			750949	6405865	32	0-10	Alive	
167	2018-08-31	*E. salmonophloia*	Nesting			750897	6405886	38	10-15	Alive	
168	2018-08-31	*E. salmonophloia*	Nesting			750856	6405926	34	10-15	Alive	
169	2018-08-31	*E. salmonophloia*	Nesting			750806	6405878	36	10-15	Alive	
170	2018-08-31	*E. salmonophloia*	Nesting	Yes		750804	6405876	42	0-10	Alive	
171	2018-08-31	*E. salmonophloia*	Nesting			750799	6405862	40	10-15	Alive	
172	2018-08-31	*E. salmonophloia*	Nesting			750806	6405862	36	10-15	Alive	
173	2018-08-31	*E. salmonophloia*	Nesting			750953	6405791	35	10-15	Alive	
174	2018-08-31	*E. salmonophloia*	Nesting			750992	6405794	40	10-15	Alive	
175	2018-08-31	*E. salmonophloia*	Nesting			750990	6405800	37	10-15	Alive	
176	2018-08-31	*E. salmonophloia*	Nesting			751011	6405796	36	0-10	Alive	
177	2018-08-31	*E. salmonophloia*	Nesting			751036	6405827	48	10-15	Alive	
178	2018-08-31	*E. salmonophloia*	Nesting			751022	6405816	42	0-10	Alive	
179	2018-08-31	*E. salmonophloia*	Nesting			751034	6405842	40	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
180	2018-08-31	*E. urna*	Nesting			751244	6405887	44	10-15	Alive	
181	2018-08-31	*E. salmonophloia*	Nesting			751304	6405831	31	0-10	Alive	
182	2018-08-31	*E. salmonophloia*	Nesting			751300	6405833	36	0-10	Alive	
183	2018-08-31	*E. salmonophloia*	Nesting			751343	6405802	34	0-10	Alive	
184	2018-08-31	*E. salmonophloia*	Nesting			751343	6405801	31	0-10	Alive	
185	2018-08-31	*E. urna*	Nesting			751504	6405891	33	0-10	Alive	
186	2018-08-31	*E. urna*	Nesting			751572	6405896	31	10-15	Alive	
187	2018-08-31	*E. urna*	Nesting			751608	6405906	38	0-10	Alive	
188	2018-08-31	*E. urna*	Nesting			751483	6405796	37	0-10	Alive	
189	2018-08-31	*E. urna*	Nesting			751465	6405795	34	0-10	Alive	
190	2018-08-31	E. salmonophloia	Nesting			750821	6405664	48	10-15	Alive	
191	2018-08-31	*E. salmonophloia*	Nesting			750891	6405963	44	10-15	Alive	
192	2018-08-31	*E. salmonophloia*	Nesting			750929	6405947	43	10-15	Alive	
193	2018-08-31	*E. salmonophloia*	Nesting			750981	6405944	37	10-15	Alive	
194	2018-08-31	*E. salmonophloia*	Nesting			750998	6405948	42	10-15	Alive	
195	2018-08-31	*E. urna*	Nesting			751341	6405964	45	10-15	Alive	
196	2018-08-31	*E. urna*	Nesting			751353	6405966	42	10-15	Alive	
197	2018-08-31	*E. urna*	Nesting			751360	6405965	40	10-15	Alive	
198	2018-08-31	*E. urna*	Nesting			751456	6405975	31	10-15	Alive	
199	2018-08-31	*E. salmonophloia*	Nesting	Yes		751044	6405904	42	10-15	Alive	
200	2018-08-31	*E. salmonophloia*	Nesting			750919	6405909	34	0-10	Alive	
201	2018-08-31	*E. salmonophloia*	Nesting			750992	6405754	41	10-15	Alive	
202	2018-08-31	*E. urna*	Nesting			751205	6405872	49	10-15	Alive	
203	2018-08-31	*E. salmonophloia*	Nesting			751289	6405811	35	10-15	Alive	
204	2018-08-31	*E. salmonophloia*	Nesting			751300	6405788	42	15-20	Alive	
205	2018-08-31	*E. urna*	Nesting			751327	6405760	35	10-15	Alive	
206	2018-08-31	*E. urna*	Nesting			751460	6405851	30	0-10	Alive	
207	2018-08-31	E. salmonophloia	Nesting			750627	6405951	31	0-10	Alive	
208	2018-08-31	E. salmonophloia	Nesting			750690	6405963	31	0-10	Alive	
209	2018-08-31	*E. salmonophloia*	Nesting			750863	6405978	40	0-10	Alive	
210	2018-08-31	*E. salmonophloia*	Nesting			750956	6405967	37	0-10	Alive	
211	2018-08-31	*E. salmonophloia*	Nesting			750986	6405942	34	0-10	Alive	
212	2018-08-31	*E. salmonophloia*	Nesting			750987	6405949	42	10-15	Alive	
213	2018-08-31	*E. salmonophloia*	Nesting			751035	6405987	31	0-10	Alive	
214	2018-08-31	*E. urna*	Nesting			751046	6405992	38	0-10	Alive	
215	2018-08-31	*E. urna*	Nesting			751059	6405995	33	0-10	Alive	
216	2018-08-31	*E. urna*	Nesting			751321	6405971	31	10-15	Alive	
217	2018-08-31	*E. urna*	Nesting			751342	6405979	51	10-15	Alive	
218	2018-08-31	*E. urna*	Nesting			751350	6405992	42	10-15	Alive	
219	2018-08-31	*E. urna*	Nesting			751354	6406002	39	10-15	Alive	
220	2018-08-31	*E. urna*	Nesting			751358	6405984	39	10-15	Alive	
221	2018-08-31	*E. urna*	Nesting			751478	6405999	35	0-10	Alive	
222	2018-08-31	*E. urna*	Nesting			751492	6405981	32	0-10	Alive	
223	2018-08-31	*E. urna*	Nesting			751508	6405987	41	10-15	Alive	
224	2018-08-31	*E. urna*	Nesting			751463	6405943	36	0-10	Alive	
225	2018-08-31	*E. urna*	Nesting			751398	6405972	30	0-10	Alive	
226	2018-08-31	*E. urna*	Nesting			751369	6405946	35	10-15	Alive	
227	2018-08-31	*E. salmonophloia*	Nesting			751088	6405913	31	0-10	Alive	
228	2018-08-31	*E. salmonophloia*	Nesting			751013	6405861	40	0-10	Alive	
229	2018-08-31	*E. salmonophloia*	Nesting			750898	6405887	37	10-15	Alive	
230	2018-08-31	*E. salmonophloia*	Nesting			750917	6405889	32	0-10	Alive	
231	2018-08-31	*E. salmonophloia*	Nesting			750885	6405927	33	0-10	Alive	
232	2018-08-31	*E. salmonophloia*	Nesting			750757	6405878	33	0-10	Alive	
233	2018-08-31	*E. salmonophloia*	Nesting			750755	6405874	46	10-15	Alive	
234	2018-08-31	*E. salmonophloia*	Nesting			750970	6405784	32	0-10	Alive	
235	2018-08-31	*E. salmonophloia*	Nesting			750977	6405797	32	0-10	Alive	
236	2018-08-31	*E. salmonophloia*	Nesting			751008	6405798	31	0-10	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
237	2018-08-31	*E. salmonophloia*	Nesting			751029	6405796	41	10-15	Alive	
238	2018-08-31	*E. salmonophloia*	Nesting			751080	6405880	40	0-10	Alive	
239	2018-08-31	*E. urna*	Nesting			751233	6405889	43	10-15	Alive	
240	2018-08-31	*E. salmonophloia*	Nesting			751245	6405807	46	10-15	Alive	
241	2018-08-31	*E. salmonophloia*	Nesting			751320	6405834	42	10-15	Alive	
242	2018-08-31	*E. salmonophloia*	Nesting			751256	6405783	38	10-15	Alive	
243	2018-08-31	*E. salmonophloia*	Nesting			751319	6405820	40	10-15	Alive	
244	2018-08-31	*E. salmonophloia*	Nesting			751328	6405777	39	10-15	Alive	
245	2018-08-31	*E. salmonophloia*	Nesting			751323	6405772	49	10-15	Alive	
246	2018-08-31	*E. salmonophloia*	Nesting			751361	6405770	36	10-15	Alive	
247	2018-08-31	*E. salmonophloia*	Nesting			751367	6405777	31	0-10	Alive	
248	2018-08-31	*E. urna*	Nesting			751410	6405865	31	10-15	Alive	
249	2018-08-31	*E. urna*	Nesting			751497	6405885	31	0-10	Alive	
250	2018-08-31	*E. urna*	Nesting			751504	6405881	30	0-10	Alive	
251	2018-08-31	*E. urna*	Nesting			751606	6405830	30	10-15	Alive	
252	2018-08-31	*E. urna*	Nesting			751475	6405807	31	10-15	Alive	
253	2018-08-31	*E. urna*	Nesting			751454	6405816	33	0-10	Alive	
254	2018-08-31	*E. urna*	Nesting			751227	6405716	30	0-10	Alive	
255	2018-08-31	*E. salmonophloia*	Nesting			750877	6405689	31	0-10	Alive	
256	2018-08-31	*E. salmonophloia*	Nesting			750870	6405676	31	10-15	Alive	
257	2018-08-31	*E. salmonophloia*	Nesting			751431	6404716	42	10-15	Alive	
258	2018-08-31	*E. salmonophloia*	Nesting			751419	6404717	32	10-15	Alive	
259	2018-08-31	*E. salmonophloia*	Nesting			751343	6404695	32	10-15	Alive	
260	2018-08-31	*E. salmonophloia*	Nesting			751334	6404700	50	10-15	Alive	
261	2018-08-31	*E. salmonophloia*	Nesting			751256	6404777	30	0-10	Alive	
262	2018-08-31	*E. salmonophloia*	Nesting			751304	6404815	30	0-10	Alive	
263	2018-08-31	*E. salmonophloia*	Nesting			751446	6404854	33	0-10	Alive	
264	2018-08-31	*E. salmonophloia*	Nesting			751449	6404859	31	10-15	Alive	
265	2018-08-31	*E. urna*	Nesting			751565	6404830	39	10-15	Alive	
266	2018-08-31	*E. salmonophloia*	Nesting			751303	6404931	30	10-15	Alive	
267	2018-08-31	*E. salmonophloia*	Nesting			751317	6404941	38	0-10	Alive	
268	2018-08-31	*E. salmonophloia*	Nesting			751423	6404949	33	10-15	Alive	
269	2018-08-31	*E. salmonophloia*	Nesting			751434	6404951	35	0-10	Alive	
270	2018-08-31	*E. salmonophloia*	Nesting			751400	6404759	40	10-15	Alive	
271	2018-08-31	*E. salmonophloia*	Nesting			751396	6404780	37	10-15	Alive	
272	2018-08-31	*E. salmonophloia*	Nesting			751367	6404738	31	10-15	Alive	
273	2018-08-31	*E. salmonophloia*	Nesting			751317	6404737	34	10-15	Alive	
274	2018-08-31	*E. salmonophloia*	Nesting			751249	6404739	31	10-15	Alive	
275	2018-08-31	*E. salmonophloia*	Nesting			751483	6404819	32	15-20	Alive	
276	2018-08-31	*E. salmonophloia*	Nesting			751457	6404923	30	0-10	Alive	
277	2018-08-31	*E. salmonophloia*	Nesting			751440	6404933	35	10-15	Alive	
278	2018-08-31	*E. urna*	Nesting			751571	6404716	35	10-15	Alive	
279	2018-08-31	*E. urna*	Nesting	Yes		751527	6404742	92	15-20	Alive	
280	2018-08-31	*E. salmonophloia*	Nesting			751492	6404737	31	10-15	Alive	
281	2018-08-31	*E. salmonophloia*	Nesting			751435	6404751	34	0-10	Alive	
282	2018-08-31	*E. salmonophloia*	Nesting			751389	6404747	38	0-10	Alive	
283	2018-08-31	*E. salmonophloia*	Nesting			751394	6404741	38	10-15	Alive	
284	2018-08-31	*E. salmonophloia*	Nesting			751380	6404733	41	10-15	Alive	
285	2018-08-31	*E. salmonophloia*	Nesting			751345	6404731	36	10-15	Alive	
286	2018-08-31	*E. salmonophloia*	Nesting			751233	6404698	33	0-10	Alive	
287	2018-08-31	*E. salmonophloia*	Nesting			751243	6404749	33	10-15	Alive	
288	2018-08-31	*E. salmonophloia*	Nesting			751282	6404779	50	10-15	Alive	
289	2018-08-31	*E. salmonophloia*	Nesting			751289	6404792	35	10-15	Alive	
290	2018-08-31	*E. salmonophloia*	Nesting			751331	6404820	43	10-15	Alive	
291	2018-08-31	*E. salmonophloia*	Nesting			751324	6404822	35	0-10	Alive	
292	2018-08-31	*E. salmonophloia*	Nesting			751479	6404815	31	10-15	Alive	
293	2018-08-31	*E. salmonophloia*	Nesting			751457	6404912	30	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
294	2018-08-31	*E. salmonophloia*	Nesting			751444	6404925	33	0-10	Alive	
295	2018-08-31	*E. salmonophloia*	Nesting			751410	6404899	31	0-10	Alive	
296	2018-08-31	*E. salmonophloia*	Nesting			751370	6404889	34	0-10	Alive	
297	2018-08-31	*E. salmonophloia*	Nesting			751366	6404890	32	0-10	Alive	
298	2018-08-31	*E. salmonophloia*	Nesting			751336	6404942	30	0-10	Alive	
299	2018-08-31	*E. salmonophloia*	Nesting			751409	6404939	31	10-15	Alive	
300	2018-08-31	*E. salmonophloia*	Nesting			751444	6404947	31	10-15	Alive	
301	2018-09-01	*E. urna*	Nesting			751610	6406061	32	0-10	Alive	
302	2018-09-01	*E. urna*	Nesting			751605	6406068	38	0-10	Alive	
303	2018-09-01	*E. urna*	Nesting			751601	6406054	32	0-10	Alive	
304	2018-09-01	*E. urna*	Nesting			751560	6406103	36	0-10	Alive	
305	2018-09-01	*E. urna*	Nesting			751497	6406156	32	0-10	Alive	
306	2018-09-01	*E. urna*	Nesting			751384	6406154	31	0-10	Alive	
307	2018-09-01	*E. urna*	Nesting			751196	6406117	31	10-15	Alive	
308	2018-09-01	*E. urna*	Nesting			750930	6406172	31	0-10	Alive	
309	2018-09-01	*E. salmonophloia*	Nesting			750824	6406115	39	0-10	Alive	
310	2018-09-01	*E. salmonophloia*	Nesting			750789	6406054	41	0-10	Alive	
311	2018-09-01	*E. salmonophloia*	Nesting			750758	6406125	33	0-10	Alive	
312	2018-09-01	*E. salmonophloia*	Nesting			750748	6406125	45	10-15	Alive	
313	2018-09-01	*E. salmonophloia*	Nesting			750729	6406132	31	0-10	Alive	
314	2018-09-01	*E. salmonophloia*	Nesting			750646	6406114	46	10-15	Alive	
315	2018-09-01	*E. salmonophloia*	Nesting			750650	6406122	37	10-15	Alive	
316	2018-09-01	*E. salmonophloia*	Nesting			750665	6406129	35	0-10	Alive	
317	2018-09-01	*E. salmonophloia*	Nesting			750754	6406159	35	0-10	Alive	
318	2018-09-01	*E. urna*	Nesting			751134	6406174	41	0-10	Alive	
319	2018-09-01	*E. urna*	Nesting			751159	6406174	36	0-10	Alive	
320	2018-09-01	*E. urna*	Nesting			751460	6406029	35	10-15	Alive	
321	2018-09-01	*E. urna*	Nesting			751458	6406024	30	0-10	Alive	
322	2018-09-01	*E. urna*	Nesting			751407	6406022	31	0-10	Alive	
323	2018-09-01	*E. urna*	Nesting	Yes		751408	6406022	33	0-10	Alive	
324	2018-09-01	*E. urna*	Nesting			751397	6406020	34	0-10	Alive	
325	2018-09-01	*E. urna*	Nesting			751305	6406038	41	10-15	Alive	
326	2018-09-01	*E. urna*	Nesting	Yes		751206	6406024	43	0-10	Alive	
327	2018-09-01	*E. urna*	Nesting			751155	6406022	39	0-10	Alive	
328	2018-09-01	*E. urna*	Nesting			751097	6406017	39	10-15	Alive	
329	2018-09-01	*E. urna*	Nesting			751069	6406033	31	0-10	Alive	
330	2018-09-01	*E. urna*	Nesting			751067	6406025	34	10-15	Alive	
331	2018-09-01	*E. urna*	Nesting			751014	6406008	35	10-15	Alive	
332	2018-09-01	*E. urna*	Nesting			751011	6406024	32	0-10	Alive	
333	2018-09-01	*E. urna*	Nesting	Yes		751006	6406031	41	10-15	Alive	
334	2018-09-01	*E. salmonophloia*	Nesting			750979	6406011	31	0-10	Alive	
335	2018-09-01	*E. salmonophloia*	Nesting			750791	6406006	31	10-15	Alive	
336	2018-09-01	*E. salmonophloia*	Nesting			750726	6406009	34	10-15	Alive	
337	2018-09-01	*E. salmonophloia*	Nesting			750661	6406018	30	10-15	Alive	
338	2018-09-01	E. salmonophloia	Nesting			750593	6406017	34	10-15	Alive	
339	2018-09-01	*E. salmonophloia*	Nesting			750929	6406074	37	0-10	Alive	
340	2018-09-01	*E. urna*	Nesting			750991	6406054	33	10-15	Alive	
341	2018-09-01	*E. urna*	Nesting			750997	6406050	31	10-15	Alive	
342	2018-09-01	*E. urna*	Nesting			751032	6406066	32	0-10	Alive	
343	2018-09-01	*E. urna*	Nesting			751067	6406083	33	0-10	Alive	
344	2018-09-01	*E. urna*	Nesting			751089	6406106	31	0-10	Alive	
345	2018-09-01	*E. urna*	Nesting			751104	6406053	33	0-10	Alive	
346	2018-09-01	*E. urna*	Nesting			751336	6406081	33	0-10	Alive	
347	2018-09-01	*E. urna*	Nesting			751458	6406066	40	10-15	Alive	
348	2018-09-01	*E. urna*	Nesting			751531	6406074	33	10-15	Alive	
349	2018-09-01	*E. urna*	Nesting			751539	6406082	35	0-10	Alive	
350	2018-09-01	*E. urna*	Nesting			751561	6406063	31	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
351	2018-09-01	*E. urna*	Nesting			751591	6406053	33	10-15	Alive	
352	2018-09-01	*E. urna*	Nesting			751596	6406057	41	10-15	Alive	
353	2018-09-01	*E. urna*	Nesting			751599	6406044	38	10-15	Alive	
354	2018-09-01	*E. urna*	Nesting			751600	6406043	33	10-15	Alive	
355	2018-09-01	*E. urna*	Nesting			751612	6406053	38	15-20	Alive	
356	2018-09-01	*E. urna*	Nesting			751607	6406046	41	15-20	Alive	
357	2018-09-01	*E. urna*	Nesting			751575	6406076	52	10-15	Alive	
358	2018-09-01	*E. urna*	Nesting			751488	6406138	33	10-15	Alive	
359	2018-09-01	*E. urna*	Nesting			751485	6406121	30	0-10	Alive	
360	2018-09-01	*E. urna*	Nesting			751244	6406096	32	10-15	Alive	
361	2018-09-01	*E. urna*	Nesting			751148	6406108	31	0-10	Alive	
362	2018-09-01	*E. urna*	Nesting			751094	6406108	40	0-10	Alive	
363	2018-09-01	*E. salmonophloia*	Nesting			750888	6406080	38	0-10	Alive	
364	2018-09-01	*E. salmonophloia*	Nesting			750651	6406049	30	0-10	Alive	
365	2018-09-01	*E. salmonophloia*	Nesting			750620	6406077	54	10-15	Alive	
366	2018-09-01	*E. salmonophloia*	Nesting	Yes		750596	6406058	41	0-10	Alive	
367	2018-09-01	*E. salmonophloia*	Nesting			750619	6406128	32	10-15	Alive	
368	2018-09-01	*E. salmonophloia*	Nesting			750615	6406130	30	10-15	Alive	
369	2018-09-01	*E. salmonophloia*	Nesting			750623	6406134	45	10-15	Alive	
370	2018-09-01	*E. salmonophloia*	Nesting			750669	6406146	36	10-15	Alive	
371	2018-09-01	*E. salmonophloia*	Nesting			750689	6406203	36	0-10	Alive	
372	2018-09-01	*E. salmonophloia*	Nesting			750762	6406185	39	15-20	Alive	
373	2018-09-01	*E. salmonophloia*	Nesting			750770	6406184	37	10-15	Alive	
374	2018-09-01	*E. urna*	Nesting			751116	6406191	32	0-10	Alive	
375	2018-09-01	*E. urna*	Nesting			751184	6406193	31	0-10	Alive	
376	2018-09-01	*E. urna*	Nesting			751496	6406235	33	0-10	Alive	
377	2018-09-01	*E. urna*	Nesting			751476	6406234	46	0-10	Alive	
378	2018-09-01	*E. urna*	Nesting			750998	6406243	36	0-10	Alive	
379	2018-09-01	*E. salmonophloia*	Nesting			750891	6406235	36	10-15	Alive	
380	2018-09-01	*E. salmonophloia*	Nesting			750810	6406244	36	0-10	Alive	
381	2018-09-01	*E. salmonophloia*	Nesting			750602	6406237	37	0-10	Alive	
382	2018-09-01	*E. salmonophloia*	Nesting			750563	6406236	43	10-15	Alive	
383	2018-09-01	*E. salmonophloia*	Nesting			750511	6406217	46	10-15	Alive	
384	2018-09-01	*E. salmonophloia*	Nesting			750533	6406259	31	0-10	Alive	
385	2018-09-01	*E. urna*	Nesting			751006	6406242	32	0-10	Alive	
386	2018-09-01	*E. urna*	Nesting			751369	6406260	35	10-15	Alive	
387	2018-09-01	*E. urna*	Nesting			751427	6406268	31	10-15	Alive	
388	2018-09-01	*E. urna*	Nesting			751535	6406253	38	10-15	Alive	
389	2018-09-01	*E. urna*	Nesting			751389	6406350	41	10-15	Alive	
390	2018-09-01	*E. urna*	Nesting			751395	6406355	34	10-15	Alive	
391	2018-09-01	*E. urna*	Nesting			751377	6406351	36	10-15	Alive	
392	2018-09-01	*E. urna*	Nesting			751320	6406334	33	0-10	Alive	
393	2018-09-01	*E. urna*	Nesting			751251	6406301	37	0-10	Alive	
394	2018-09-01	*E. urna*	Nesting			751179	6406298	33	0-10	Alive	
395	2018-09-01	*E. urna*	Nesting			751111	6406296	41	10-15	Alive	
396	2018-09-01	*E. urna*	Nesting			751010	6406302	42	10-15	Alive	
397	2018-09-01	*E. salmonophloia*	Nesting			750885	6406310	40	10-15	Alive	
398	2018-09-01	*E. salmonophloia*	Nesting			750811	6406331	42	10-15	Alive	
399	2018-09-01	*E. salmonophloia*	Nesting			750789	6406343	33	10-15	Alive	
400	2018-09-01	*E. salmonophloia*	Nesting			750790	6406352	50	10-15	Alive	
401	2018-09-01	*E. salmonophloia*	Nesting			750765	6406352	39	10-15	Alive	
402	2018-09-01	*E. salmonophloia*	Nesting			750767	6406345	33	10-15	Alive	
403	2018-09-01	*E. salmonophloia*	Nesting			750764	6406347	32	10-15	Alive	
404	2018-09-01	*E. salmonophloia*	Nesting			750717	6406328	46	10-15	Alive	
405	2018-09-01	*E. salmonophloia*	Nesting			750658	6406303	39	10-15	Alive	
406	2018-09-01	*E. salmonophloia*	Nesting			750639	6406284	67	10-15	Alive	
407	2018-09-01	*E. salmonophloia*	Nesting			750580	6406324	39	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
408	2018-09-01	*E. salmonophloia*	Nesting			750574	6406321	33	10-15	Alive	
409	2018-09-01	*E. salmonophloia*	Nesting			750508	6406318	38	10-15	Alive	
410	2018-09-01	*E. salmonophloia*	Nesting			750505	6406329	33	0-10	Alive	
411	2018-09-01	*E. salmonophloia*	Nesting	Yes		750603	6406325	34	0-10	Alive	
412	2018-09-01	*E. salmonophloia*	Nesting			750660	6406310	34	10-15	Alive	
413	2018-09-01	*E. salmonophloia*	Nesting			750741	6406356	33	0-10	Alive	
414	2018-09-01	*E. salmonophloia*	Nesting			750764	6406359	32	0-10	Alive	
415	2018-09-01	*E. urna*	Nesting			750952	6406292	42	0-10	Alive	
416	2018-09-01	*E. urna*	Nesting			751375	6406361	35	10-15	Alive	
417	2018-09-01	*E. urna*	Nesting			751407	6406359	40	10-15	Alive	
418	2018-09-01	*E. urna*	Nesting			751487	6406343	34	10-15	Alive	
419	2018-09-01	*E. salmonophloia*	Nesting			750719	6406226	33	10-15	Alive	
420	2018-09-01	*E. salmonophloia*	Nesting			750557	6406257	31	10-15	Alive	
421	2018-09-01	*E. salmonophloia*	Nesting			750607	6406267	50	0-10	Alive	
422	2018-09-01	*E. urna*	Nesting			751266	6406259	31	0-10	Alive	
423	2018-09-01	*E. urna*	Nesting			751298	6406296	37	10-15	Alive	
424	2018-09-01	*E. urna*	Nesting			751300	6406293	36	10-15	Alive	
425	2018-09-01	*E. urna*	Nesting			751087	6406285	42	10-15	Alive	
426	2018-09-01	*E. urna*	Nesting			751060	6406292	31	10-15	Alive	
427	2018-09-01	*E. salmonophloia*	Nesting			750835	6406320	42	10-15	Alive	
428	2018-09-01	*E. salmonophloia*	Nesting			750756	6406271	41	0-10	Alive	
429	2018-09-01	*E. salmonophloia*	Nesting			750734	6406322	32	0-10	Alive	
430	2018-09-01	*E. salmonophloia*	Nesting			750683	6406296	40	0-10	Alive	
431	2018-09-01	*E. salmonophloia*	Nesting			750683	6406298	44	10-15	Alive	
432	2018-09-01	*E. salmonophloia*	Nesting			750618	6406311	48	10-15	Alive	
433	2018-09-01	*E. salmonophloia*	Nesting			750697	6406343	57	10-15	Alive	
434	2018-09-01	*E. salmonophloia*	Nesting			750779	6406384	31	0-10	Alive	
435	2018-09-01	*E. salmonophloia*	Nesting			750858	6406336	31	10-15	Alive	
436	2018-09-01	*E. urna*	Nesting			751333	6406359	35	10-15	Alive	
437	2018-09-01	*E. urna*	Nesting			751363	6406388	36	0-10	Alive	
438	2018-09-01	*E. urna*	Nesting			751404	6406374	36	10-15	Alive	
439	2018-09-01	*E. urna*	Nesting			751409	6406371	39	10-15	Alive	
440	2018-09-01	*E. urna*	Nesting			751528	6406203	31	10-15	Alive	
441	2018-09-01	*E. urna*	Nesting			751496	6406209	31	10-15	Alive	
442	2018-09-01	*E. urna*	Nesting			751442	6406214	36	10-15	Alive	
443	2018-09-01	*E. urna*	Nesting			751118	6406202	36	10-15	Alive	
444	2018-09-01	*E. urna*	Nesting			751086	6406199	36	10-15	Alive	
445	2018-09-01	*E. salmonophloia*	Nesting			750832	6406203	30	0-10	Alive	
446	2018-09-01	*E. salmonophloia*	Nesting			750783	6406206	35	10-15	Alive	
447	2018-09-01	*E. salmonophloia*	Nesting			750750	6406201	40	10-15	Alive	
448	2018-09-01	*E. salmonophloia*	Nesting			750714	6406218	34	0-10	Alive	
449	2018-09-01	*E. salmonophloia*	Nesting			750699	6406227	37	10-15	Alive	
450	2018-09-01	*E. salmonophloia*	Nesting			750685	6406216	32	0-10	Alive	
451	2018-09-01	*E. salmonophloia*	Nesting			750615	6406216	32	10-15	Alive	
452	2018-09-01	*E. salmonophloia*	Nesting	Yes		750590	6406203	43	0-10	Alive	
453	2018-09-01	*E. salmonophloia*	Nesting			750511	6406205	32	10-15	Alive	
454	2018-09-01	*E. salmonophloia*	Nesting			750498	6406202	46	10-15	Alive	
455	2018-09-01	*E. salmonophloia*	Nesting			750525	6406283	47	10-15	Alive	
456	2018-09-01	*E. salmonophloia*	Nesting			750509	6406280	52	10-15	Alive	
457	2018-09-01	*E. salmonophloia*	Nesting			750553	6406278	39	10-15	Alive	
458	2018-09-01	*E. salmonophloia*	Nesting			750570	6406277	30	0-10	Alive	
459	2018-09-01	*E. salmonophloia*	Nesting			750573	6406276	48	10-15	Alive	
460	2018-09-01	*E. salmonophloia*	Nesting			750609	6406276	33	0-10	Alive	
461	2018-09-01	*E. salmonophloia*	Nesting			750720	6406270	39	10-15	Alive	
462	2018-09-01	*E. salmonophloia*	Nesting			750742	6406289	35	0-10	Alive	
463	2018-09-01	*E. salmonophloia*	Nesting	Yes		750803	6406288	50	0-10	Alive	
464	2018-09-01	*E. salmonophloia*	Nesting			750892	6406282	37	0-10	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
465	2018-09-01	*E. urna*	Nesting			751031	6406262	36	0-10	Alive	
466	2018-09-01	*E. urna*	Nesting			751018	6406271	31	10-15	Alive	
467	2018-09-01	*E. urna*	Nesting			751050	6406279	37	10-15	Alive	
468	2018-09-01	*E. urna*	Nesting			751109	6406253	47	10-15	Alive	
469	2018-09-01	*E. urna*	Nesting			751269	6406263	31	10-15	Alive	
470	2018-09-01	*E. urna*	Nesting			751278	6406268	34	10-15	Alive	
471	2018-09-01	*E. urna*	Nesting			751335	6406260	38	10-15	Alive	
472	2018-09-01	*E. urna*	Nesting			751403	6406283	37	10-15	Alive	
473	2018-09-01	*E. urna*	Nesting			751464	6406280	40	10-15	Alive	
474	2018-09-01	*E. urna*	Nesting			751529	6406282	31	0-10	Alive	
475	2018-09-01	*E. urna*	Nesting			751450	6406310	42	10-15	Alive	
476	2018-09-01	*E. urna*	Nesting			751362	6406313	37	10-15	Alive	
477	2018-09-01	*E. urna*	Nesting			751346	6406317	34	0-10	Alive	
478	2018-09-01	*E. urna*	Nesting			751354	6406303	33	0-10	Alive	
479	2018-09-01	*E. urna*	Nesting			751348	6406297	34	0-10	Alive	
480	2018-09-01	*E. urna*	Nesting			751328	6406282	41	10-15	Alive	
481	2018-09-01	*E. urna*	Nesting			751143	6406275	37	10-15	Alive	
482	2018-09-01	*E. urna*	Nesting			751092	6406284	35	10-15	Alive	
483	2018-09-01	*E. salmonophloia*	Nesting			750825	6406305	52	10-15	Alive	
484	2018-09-01	*E. salmonophloia*	Nesting			750750	6406305	40	0-10	Alive	
485	2018-09-01	*E. salmonophloia*	Nesting			750746	6406311	40	10-15	Alive	
486	2018-09-01	*E. salmonophloia*	Nesting			750734	6406311	33	0-10	Alive	
487	2018-09-01	*E. salmonophloia*	Nesting			750723	6406307	38	0-10	Alive	
488	2018-09-01	*E. salmonophloia*	Nesting			750721	6406280	34	10-15	Alive	
489	2018-09-01	*E. salmonophloia*	Nesting			750695	6406282	32	0-10	Alive	
490	2018-09-01	*E. salmonophloia*	Nesting			750665	6406305	38	0-10	Alive	
491	2018-09-01	*E. salmonophloia*	Nesting			750648	6406338	31	0-10	Alive	
492	2018-09-01	*E. salmonophloia*	Nesting			750652	6406352	50	15-20	Alive	
493	2018-09-01	*E. salmonophloia*	Nesting			750678	6406359	35	10-15	Alive	
494	2018-09-01	*E. salmonophloia*	Nesting			750658	6406351	42	15-20	Alive	
495	2018-09-01	*E. salmonophloia*	Nesting			750744	6406369	42	10-15	Alive	
496	2018-09-01	*E. salmonophloia*	Nesting			750749	6406395	38	10-15	Alive	
497	2018-09-01	*E. salmonophloia*	Nesting			750766	6406385	62	10-15	Alive	
498	2018-09-01	*E. salmonophloia*	Nesting			750805	6406392	32	0-10	Alive	
499	2018-09-01	*E. salmonophloia*	Nesting			750805	6406381	37	10-15	Alive	
500	2018-09-01	*E. urna*	Nesting			751064	6406343	32	0-10	Alive	
501	2018-09-01	*E. urna*	Nesting			751163	6406320	36	10-15	Alive	
502	2018-09-01	*E. urna*	Nesting			751329	6406334	33	10-15	Alive	
503	2018-09-01	*E. urna*	Nesting			751347	6406364	40	10-15	Alive	
504	2018-09-01	*E. urna*	Nesting			751392	6406401	46	10-15	Alive	
505	2018-09-01	*E. urna*	Nesting			751408	6406386	35	10-15	Alive	
506	2018-09-01	*E. urna*	Nesting			751463	6406396	37	10-15	Alive	
507	2018-09-02	*E. salmonophloia*	Nesting			751411	6405027	41	0-10	Alive	
508	2018-09-02	*E. urna*	Nesting			751555	6405037	52	10-15	Alive	
509	2018-09-02	*E. salmonophloia*	Nesting			751450	6405054	43	10-15	Alive	
510	2018-09-02	*E. salmonophloia*	Nesting			751431	6405064	40	0-10	Alive	
511	2018-09-02	*E. salmonophloia*	Nesting			751416	6405059	32	0-10	Alive	
512	2018-09-02	*E. salmonophloia*	Nesting			751407	6405039	39	0-10	Alive	
513	2018-09-02	*E. salmonophloia*	Nesting			751222	6405091	32	0-10	Alive	
514	2018-09-02	*E. salmonophloia*	Nesting			751450	6405124	32	10-15	Alive	
515	2018-09-02	*E. urna*	Nesting			751510	6405141	52	0-10	Alive	
516	2018-09-02	*E. salmonophloia*	Nesting			751263	6405176	33	0-10	Alive	
517	2018-09-02	*E. salmonophloia*	Nesting			751312	6405160	31	10-15	Alive	
518	2018-09-02	*E. urna*	Nesting			751595	6405173	66	10-15	Alive	
519	2018-09-02	*E. urna*	Nesting			751484	6404971	32	0-10	Alive	
520	2018-09-02	*E. salmonophloia*	Nesting			751455	6404978	74	10-15	Alive	
521	2018-09-02	*E. urna*	Nesting			751555	6405044	30	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
522	2018-09-02	*E. urna*	Nesting			751491	6406414	56	10-15	Alive	
523	2018-09-02	*E. urna*	Nesting			751485	6406425	30	10-15	Alive	
524	2018-09-02	*E. urna*	Nesting			751432	6406429	34	0-10	Alive	
525	2018-09-02	*E. urna*	Nesting			751425	6406435	35	10-15	Alive	
526	2018-09-02	*E. urna*	Nesting			751367	6406422	30	10-15	Alive	
527	2018-09-02	*E. urna*	Nesting			751334	6406418	36	10-15	Alive	
528	2018-09-02	*E. urna*	Nesting			751300	6406412	33	0-10	Alive	
529	2018-09-02	*E. urna*	Nesting			751303	6406406	32	0-10	Alive	
530	2018-09-02	*E. urna*	Nesting			751263	6406402	32	10-15	Alive	
531	2018-09-02	*E. urna*	Nesting			751257	6406420	38	10-15	Alive	
532	2018-09-02	*E. urna*	Nesting			751231	6406420	33	0-10	Alive	
533	2018-09-02	*E. urna*	Nesting			751201	6406388	40	10-15	Alive	
534	2018-09-02	*E. urna*	Nesting			751175	6406436	37	0-10	Alive	
535	2018-09-02	*E. urna*	Nesting			751053	6406394	32	0-10	Alive	
536	2018-09-02	*E. urna*	Nesting			751028	6406411	43	0-10	Alive	
537	2018-09-02	*E. salmonophloia*	Nesting			750973	6406367	37	10-15	Alive	
538	2018-09-02	*E. salmonophloia*	Nesting			750967	6406367	36	10-15	Alive	
539	2018-09-02	*E. salmonophloia*	Nesting			750975	6406370	31	10-15	Alive	
540	2018-09-02	*E. salmonophloia*	Nesting			750983	6406362	32	10-15	Alive	
541	2018-09-02	*E. salmonophloia*	Nesting			750977	6406350	34	10-15	Alive	
542	2018-09-02	*E. salmonophloia*	Nesting			750967	6406350	32	10-15	Alive	
543	2018-09-02	*E. salmonophloia*	Nesting			750960	6406343	31	10-15	Alive	
544	2018-09-02	*E. salmonophloia*	Nesting			750965	6406331	33	10-15	Alive	
545	2018-09-02	*E. salmonophloia*	Nesting			750958	6406337	34	10-15	Alive	
546	2018-09-02	*E. salmonophloia*	Nesting			750958	6406317	35	10-15	Alive	
547	2018-09-02	*E. salmonophloia*	Nesting			750974	6406331	44	10-15	Alive	
548	2018-09-02	*E. urna*	Nesting			751001	6406317	36	10-15	Alive	
549	2018-09-02	*E. urna*	Nesting			751013	6406317	31	0-10	Alive	
550	2018-09-02	*E. salmonophloia*	Nesting			750994	6406338	34	0-10	Alive	
551	2018-09-02	*E. salmonophloia*	Nesting			750898	6406414	35	10-15	Alive	
552	2018-09-02	*E. salmonophloia*	Nesting			750901	6406406	40	10-15	Alive	
553	2018-09-02	*E. salmonophloia*	Nesting			750888	6406391	47	10-15	Alive	
554	2018-09-02	*E. salmonophloia*	Nesting			750882	6406409	34	10-15	Alive	
555	2018-09-02	*E. salmonophloia*	Nesting			750876	6406416	32	10-15	Alive	
556	2018-09-02	*E. salmonophloia*	Nesting			750872	6406421	34	0-10	Alive	
557	2018-09-02	*E. salmonophloia*	Nesting			750852	6406412	30	0-10	Alive	
558	2018-09-02	*E. salmonophloia*	Nesting			750851	6406398	49	10-15	Alive	
559	2018-09-02	*E. salmonophloia*	Nesting			750852	6406411	39	10-15	Alive	
560	2018-09-02	*E. salmonophloia*	Nesting			750848	6406416	34	0-10	Alive	
561	2018-09-02	*E. salmonophloia*	Nesting			750836	6406427	37	10-15	Alive	
562	2018-09-02	*E. salmonophloia*	Nesting			750816	6406428	34	0-10	Alive	
563	2018-09-02	*E. salmonophloia*	Nesting			750829	6406412	31	0-10	Alive	
564	2018-09-02	*E. salmonophloia*	Nesting			750811	6406432	35	0-10	Alive	
565	2018-09-02	*E. salmonophloia*	Nesting			750809	6406444	38	0-10	Alive	
566	2018-09-02	*E. salmonophloia*	Nesting			750815	6406455	31	0-10	Alive	
567	2018-09-02	*E. salmonophloia*	Nesting			750792	6406452	32	10-15	Alive	
568	2018-09-02	*E. salmonophloia*	Nesting			750784	6406455	35	0-10	Alive	
569	2018-09-02	*E. salmonophloia*	Nesting			750788	6406426	38	10-15	Alive	
570	2018-09-02	*E. salmonophloia*	Nesting			750788	6406437	34	10-15	Alive	
571	2018-09-02	*E. salmonophloia*	Nesting			750769	6406414	42	10-15	Alive	
572	2018-09-02	*E. salmonophloia*	Nesting			750760	6406430	32	10-15	Alive	
573	2018-09-02	*E. salmonophloia*	Nesting			750768	6406449	47	15-20	Alive	
574	2018-09-02	*E. salmonophloia*	Nesting			750768	6406443	38	15-20	Alive	
575	2018-09-02	*E. salmonophloia*	Nesting			750776	6406427	36	15-20	Alive	
576	2018-09-02	*E. salmonophloia*	Nesting			750745	6406449	72	15-20	Alive	
577	2018-09-02	*E. salmonophloia*	Nesting			750753	6406454	39	10-15	Alive	
578	2018-09-02	*E. salmonophloia*	Nesting			750760	6406462	32	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
579	2018-09-02	*E. salmonophloia*	Nesting			750746	6406457	37	10-15	Alive	
580	2018-09-02	*E. salmonophloia*	Nesting			750743	6406453	32	0-10	Alive	
581	2018-09-02	*E. salmonophloia*	Nesting			750722	6406437	54	15-20	Alive	
582	2018-09-02	*E. salmonophloia*	Nesting			750714	6406433	42	15-20	Alive	
583	2018-09-02	*E. salmonophloia*	Nesting			750694	6406446	37	10-15	Alive	
584	2018-09-02	*E. salmonophloia*	Nesting			750698	6406429	45	0-10	Alive	
585	2018-09-02	*E. salmonophloia*	Nesting			750688	6406408	43	10-15	Alive	
586	2018-09-02	*E. salmonophloia*	Nesting			750688	6406365	52	15-20	Alive	
587	2018-09-02	*E. salmonophloia*	Nesting			750662	6406369	43	15-20	Alive	
588	2018-09-02	*E. salmonophloia*	Nesting			750663	6406375	45	10-15	Alive	
589	2018-09-02	*E. salmonophloia*	Nesting			750659	6406383	40	15-20	Alive	
590	2018-09-02	*E. salmonophloia*	Nesting			750678	6406406	39	0-10	Alive	
591	2018-09-02	*E. salmonophloia*	Nesting			750693	6406433	44	0-10	Alive	
592	2018-09-02	*E. salmonophloia*	Nesting			750677	6406421	42	0-10	Alive	
593	2018-09-02	*E. salmonophloia*	Nesting			750671	6406430	39	10-15	Alive	
594	2018-09-02	*E. salmonophloia*	Nesting			750664	6406435	37	10-15	Alive	
595	2018-09-02	*E. salmonophloia*	Nesting			750649	6406386	55	15-20	Alive	
596	2018-09-02	*E. salmonophloia*	Nesting			750632	6406397	49	10-15	Alive	
597	2018-09-02	*E. salmonophloia*	Nesting			750627	6406416	40	10-15	Alive	
598	2018-09-02	*E. salmonophloia*	Nesting			750657	6406423	39	10-15	Alive	
599	2018-09-02	*E. salmonophloia*	Nesting			750647	6406427	39	10-15	Alive	
600	2018-09-02	*E. salmonophloia*	Nesting			750610	6406387	57	15-20	Alive	
601	2018-09-02	*E. salmonophloia*	Nesting			750596	6406389	32	0-10	Alive	
602	2018-09-02	*E. salmonophloia*	Nesting			750581	6406388	42	10-15	Alive	
603	2018-09-02	*E. salmonophloia*	Nesting			750572	6406394	37	10-15	Alive	
604	2018-09-02	*E. salmonophloia*	Nesting			750586	6406427	51	15-20	Alive	
605	2018-09-02	*E. salmonophloia*	Nesting			750589	6406415	37	10-15	Alive	
606	2018-09-02	*E. salmonophloia*	Nesting			750601	6406426	41	15-20	Alive	
607	2018-09-02	*E. salmonophloia*	Nesting			750579	6406434	36	15-20	Alive	
608	2018-09-02	*E. salmonophloia*	Nesting			750577	6406433	30	15-20	Alive	
609	2018-09-02	*E. salmonophloia*	Nesting			750573	6406417	38	15-20	Alive	
610	2018-09-02	*E. salmonophloia*	Nesting			750583	6406428	40	15-20	Alive	
611	2018-09-02	*E. salmonophloia*	Nesting			750555	6406416	50	15-20	Alive	
612	2018-09-02	*E. salmonophloia*	Nesting			750551	6406414	43	10-15	Alive	
613	2018-09-02	*E. salmonophloia*	Nesting			750556	6406384	42	10-15	Alive	
614	2018-09-02	*E. salmonophloia*	Nesting			750559	6406381	32	0-10	Alive	
615	2018-09-02	*E. salmonophloia*	Nesting			750489	6406429	48	15-20	Alive	
616	2018-09-02	*E. salmonophloia*	Nesting			750511	6406411	35	0-10	Alive	
617	2018-09-02	*E. salmonophloia*	Nesting			750508	6406450	47	10-15	Alive	
618	2018-09-02	*E. salmonophloia*	Nesting			750523	6406472	37	10-15	Alive	
619	2018-09-02	*E. salmonophloia*	Nesting			750509	6406446	37	10-15	Alive	
620	2018-09-02	*E. salmonophloia*	Nesting			750502	6406459	45	10-15	Alive	
621	2018-09-02	*E. salmonophloia*	Nesting			750506	6406475	46	15-20	Alive	
622	2018-09-02	*E. salmonophloia*	Nesting			750491	6406465	43	10-15	Alive	
623	2018-09-02	*E. salmonophloia*	Nesting			750497	6406482	52	15-20	Alive	
624	2018-09-02	*E. salmonophloia*	Nesting			750521	6406467	34	15-20	Alive	
625	2018-09-02	*E. salmonophloia*	Nesting			750536	6406472	33	10-15	Alive	
626	2018-09-02	*E. salmonophloia*	Nesting			750537	6406481	35	0-10	Alive	
627	2018-09-02	*E. salmonophloia*	Nesting			750581	6406446	45	10-15	Alive	
628	2018-09-02	*E. salmonophloia*	Nesting			750582	6406430	34	0-10	Alive	
629	2018-09-02	*E. salmonophloia*	Nesting			750618	6406444	36	10-15	Alive	
630	2018-09-02	*E. salmonophloia*	Nesting			750609	6406468	39	10-15	Alive	
631	2018-09-02	*E. salmonophloia*	Nesting			750644	6406430	34	10-15	Alive	
632	2018-09-02	*E. salmonophloia*	Nesting			750645	6406440	49	10-15	Alive	
633	2018-09-02	*E. salmonophloia*	Nesting			750662	6406456	33	10-15	Alive	
634	2018-09-02	*E. salmonophloia*	Nesting			750656	6406454	36	10-15	Alive	
635	2018-09-02	*E. salmonophloia*	Nesting			750675	6406465	38	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
636	2018-09-02	*E. salmonophloia*	Nesting			750683	6406474	37	10-15	Alive	
637	2018-09-02	*E. salmonophloia*	Nesting			750682	6406471	48	10-15	Alive	
638	2018-09-02	*E. salmonophloia*	Nesting			750688	6406470	53	10-15	Alive	
639	2018-09-02	*E. salmonophloia*	Nesting			750689	6406477	33	10-15	Alive	
640	2018-09-02	*E. salmonophloia*	Nesting			750692	6406478	39	10-15	Alive	
641	2018-09-02	*E. salmonophloia*	Nesting			750713	6406480	39	10-15	Alive	
642	2018-09-02	*E. salmonophloia*	Nesting			750720	6406479	37	10-15	Alive	
643	2018-09-02	*E. salmonophloia*	Nesting			750719	6406468	38	10-15	Alive	
644	2018-09-02	*E. salmonophloia*	Nesting			750721	6406467	38	10-15	Alive	
645	2018-09-02	*E. salmonophloia*	Nesting			750740	6406481	51	10-15	Alive	
646	2018-09-02	*E. salmonophloia*	Nesting			750757	6406472	31	0-10	Alive	
647	2018-09-02	*E. salmonophloia*	Nesting			750755	6406472	34	10-15	Alive	
648	2018-09-02	*E. salmonophloia*	Nesting			750772	6406465	33	0-10	Alive	
649	2018-09-02	*E. salmonophloia*	Nesting			750770	6406471	41	10-15	Alive	
650	2018-09-02	*E. salmonophloia*	Nesting			750763	6406491	34	10-15	Alive	
651	2018-09-02	*E. salmonophloia*	Nesting			750783	6406475	36	10-15	Alive	
652	2018-09-02	*E. salmonophloia*	Nesting			750947	6406464	34	0-10	Alive	
653	2018-09-02	*E. salmonophloia*	Nesting			750934	6406448	35	0-10	Alive	
654	2018-09-02	*E. salmonophloia*	Nesting			750943	6406437	32	10-15	Alive	
655	2018-09-02	*E. urna*	Nesting			751028	6406445	35	0-10	Alive	
656	2018-09-02	*E. urna*	Nesting			751027	6406431	33	0-10	Alive	
657	2018-09-02	*E. urna*	Nesting			751040	6406441	33	0-10	Alive	
658	2018-09-02	*E. urna*	Nesting			751030	6406459	34	0-10	Alive	
659	2018-09-02	*E. urna*	Nesting			751061	6406457	31	0-10	Alive	
660	2018-09-02	*E. urna*	Nesting			751060	6406481	46	0-10	Alive	
661	2018-09-02	*E. urna*	Nesting			751120	6406477	30	0-10	Alive	
662	2018-09-02	*E. urna*	Nesting			751126	6406486	42	10-15	Alive	
663	2018-09-02	*E. urna*	Nesting			751166	6406501	37	0-10	Alive	
664	2018-09-02	*E. urna*	Nesting			751177	6406493	34	0-10	Alive	
665	2018-09-02	*E. urna*	Nesting			751185	6406493	30	0-10	Alive	
666	2018-09-02	*E. urna*	Nesting			751205	6406498	33	0-10	Alive	
667	2018-09-02	*E. urna*	Nesting			751283	6406456	36	10-15	Alive	
668	2018-09-02	*E. urna*	Nesting			751280	6406467	38	10-15	Alive	
669	2018-09-02	*E. urna*	Nesting			751287	6406451	38	10-15	Alive	
670	2018-09-02	*E. urna*	Nesting			751290	6406459	34	10-15	Alive	
671	2018-09-02	*E. urna*	Nesting			751300	6406454	39	10-15	Alive	
672	2018-09-02	*E. urna*	Nesting			751317	6406467	31	10-15	Alive	
673	2018-09-02	*E. urna*	Nesting			751320	6406434	42	10-15	Alive	
674	2018-09-02	*E. urna*	Nesting			751304	6406434	33	10-15	Alive	
675	2018-09-02	*E. urna*	Nesting			751417	6406478	43	10-15	Alive	
676	2018-09-02	*E. urna*	Nesting			751422	6406484	30	0-10	Alive	
677	2018-09-02	*E. urna*	Nesting			751425	6406476	33	10-15	Alive	
678	2018-09-02	*E. urna*	Nesting			751403	6406491	37	10-15	Alive	
679	2018-09-02	*E. urna*	Nesting			751304	6406513	33	0-10	Alive	
680	2018-09-02	*E. urna*	Nesting			751267	6406518	31	0-10	Alive	
681	2018-09-02	*E. urna*	Nesting			751228	6406542	53	10-15	Alive	
682	2018-09-02	*E. urna*	Nesting			751162	6406562	34	10-15	Alive	
683	2018-09-02	*E. urna*	Nesting			751145	6406559	38	0-10	Alive	
684	2018-09-02	*E. urna*	Nesting			751134	6406564	40	10-15	Alive	
685	2018-09-02	*E. urna*	Nesting			751037	6406515	31	10-15	Alive	
686	2018-09-02	*E. salmonophloia*	Nesting			750738	6406515	31	10-15	Alive	
687	2018-09-02	*E. salmonophloia*	Nesting			750729	6406511	36	10-15	Alive	
688	2018-09-02	*E. salmonophloia*	Nesting			750686	6406504	33	10-15	Alive	
689	2018-09-02	*E. salmonophloia*	Nesting			750691	6406503	33	0-10	Alive	
690	2018-09-02	*E. salmonophloia*	Nesting			750674	6406507	31	0-10	Alive	
691	2018-09-02	*E. salmonophloia*	Nesting			750591	6406508	38	10-15	Alive	
692	2018-09-02	*E. salmonophloia*	Nesting			750571	6406504	37	10-15	Alive	

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693	2018-09-02	*E. salmonophloia*	Nesting			750539	6406512	51	10-15	Alive	
694	2018-09-02	*E. salmonophloia*	Nesting			750509	6406513	35	0-10	Alive	
695	2018-09-02	*E. salmonophloia*	Nesting			750686	6406528	34	10-15	Alive	
696	2018-09-02	*E. salmonophloia*	Nesting			750851	6406562	47	10-15	Alive	
697	2018-09-02	*E. salmonophloia*	Nesting			750927	6406554	35	0-10	Alive	
698	2018-09-02	*E. urna*	Nesting			751128	6406570	36	10-15	Alive	
699	2018-09-02	*E. urna*	Nesting			751134	6406576	36	0-10	Alive	
700	2018-09-02	*E. urna*	Nesting			751143	6406578	35	10-15	Alive	
701	2018-09-02	*E. urna*	Nesting			751164	6406591	34	10-15	Alive	
702	2018-09-02	*E. urna*	Nesting			751169	6406583	32	10-15	Alive	
703	2018-09-02	*E. urna*	Nesting			751212	6406574	33	10-15	Alive	
704	2018-09-02	*E. urna*	Nesting			751232	6406566	31	0-10	Alive	
705	2018-09-02	*E. urna*	Nesting			751243	6406568	37	0-10	Alive	
706	2018-09-02	*E. urna*	Nesting			751256	6406563	49	10-15	Alive	
707	2018-09-02	*E. urna*	Nesting			751285	6406542	68	10-15	Alive	
708	2018-09-02	*E. urna*	Nesting			751299	6406519	32	0-10	Alive	
709	2018-09-02	*E. urna*	Nesting			751393	6406506	40	10-15	Alive	
710	2018-09-02	*E. urna*	Nesting			751424	6406484	32	0-10	Alive	
711	2018-09-02	*E. urna*	Nesting			751276	6406596	40	0-10	Alive	
712	2018-09-02	*E. urna*	Nesting			751188	6406662	50	10-15	Alive	
713	2018-09-02	*E. urna*	Nesting			751150	6406665	58	10-15	Alive	
714	2018-09-02	*E. urna*	Nesting			751115	6406661	58	10-15	Alive	
715	2018-09-02	*E. urna*	Nesting			751111	6406658	34	10-15	Alive	
716	2018-09-02	*E. urna*	Nesting			751105	6406658	37	10-15	Alive	
717	2018-09-02	*E. urna*	Nesting			751133	6406663	36	0-10	Alive	
718	2018-09-02	*E. urna*	Nesting			751085	6406649	43	10-15	Alive	
719	2018-09-02	*E. urna*	Nesting			751075	6406655	44	10-15	Alive	
720	2018-09-02	*E. urna*	Nesting			751065	6406643	37	10-15	Alive	
721	2018-09-02	*E. urna*	Nesting			751061	6406641	45	15-20	Alive	
722	2018-09-02	*E. salmonophloia*	Nesting			750842	6406642	48	15-20	Alive	
723	2018-09-02	*E. longicornis*	Nesting			750516	6406637	46	0-10	Alive	
724	2018-09-02	*E. salmonophloia*	Nesting			750592	6406645	35	10-15	Alive	
725	2018-09-02	*E. salmonophloia*	Nesting			750649	6406653	30	10-15	Alive	
726	2018-09-02	*E. salmonophloia*	Nesting			750874	6406657	58	15-20	Alive	
727	2018-09-02	*E. salmonophloia*	Nesting			750876	6406650	45	15-20	Alive	
728	2018-09-02	*E. urna*	Nesting			751072	6406663	48	10-15	Alive	
729	2018-09-02	*E. urna*	Nesting			751438	6406451	41	10-15	Alive	
730	2018-09-02	*E. urna*	Nesting			751265	6406501	39	0-10	Alive	
731	2018-09-02	*E. salmonophloia*	Nesting			750780	6406515	30	10-15	Alive	
732	2018-09-02	*E. salmonophloia*	Nesting			750774	6406498	32	15-20	Alive	
733	2018-09-02	*E. salmonophloia*	Nesting			750748	6406500	33	15-20	Alive	
734	2018-09-02	*E. salmonophloia*	Nesting			750522	6406499	35	10-15	Alive	
735	2018-09-02	*E. salmonophloia*	Nesting			750878	6406565	31	0-10	Alive	
736	2018-09-02	*E. urna*	Nesting			751134	6406587	35	0-10	Alive	
737	2018-09-02	*E. urna*	Nesting			751154	6406589	33	10-15	Alive	
738	2018-09-02	*E. urna*	Nesting			751164	6406586	39	0-10	Alive	
739	2018-09-02	*E. urna*	Nesting			751195	6406582	30	10-15	Alive	
740	2018-09-02	*E. urna*	Nesting			751222	6406579	30	10-15	Alive	
741	2018-09-02	*E. urna*	Nesting			751241	6406582	32	10-15	Alive	
742	2018-09-02	*E. urna*	Nesting			751397	6406503	31	0-10	Alive	
743	2018-09-02	*E. urna*	Nesting			751257	6406618	36	10-15	Alive	
744	2018-09-02	*E. urna*	Nesting			751197	6406636	31	0-10	Alive	
745	2018-09-02	*E. urna*	Nesting			751160	6406664	46	10-15	Alive	
746	2018-09-02	*E. urna*	Nesting	Yes		751123	6406669	37	15-20	Alive	
747	2018-09-02	*E. urna*	Nesting			751108	6406641	32	10-15	Alive	
748	2018-09-02	*E. urna*	Nesting			751111	6406639	44	15-20	Alive	
749	2018-09-02	*E. urna*	Nesting			751112	6406645	31	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
750	2018-09-02	*E. urna*	Nesting			751102	6406634	36	10-15	Alive	
751	2018-09-02	*E. urna*	Nesting			751108	6406637	32	15-20	Alive	
752	2018-09-02	*E. urna*	Nesting			751090	6406633	35	10-15	Alive	
753	2018-09-02	*E. urna*	Nesting			751076	6406636	30	15-20	Alive	
754	2018-09-02	*E. longicornis*	Nesting			750524	6406645	39	10-15	Alive	
755	2018-09-02	*E. urna*	Nesting			751493	6406453	32	0-10	Alive	
756	2018-09-02	*E. urna*	Nesting			751405	6406456	42	10-15	Alive	
757	2018-09-02	*E. urna*	Nesting			751368	6406466	33	0-10	Alive	
758	2018-09-02	*E. urna*	Nesting			751287	6406489	35	10-15	Alive	
759	2018-09-02	*E. urna*	Nesting			751199	6406510	37	0-10	Alive	
760	2018-09-02	*E. salmonophloia*	Nesting			750964	6406503	33	0-10	Alive	
761	2018-09-02	*E. salmonophloia*	Nesting			750799	6406530	31	0-10	Alive	
762	2018-09-02	*E. salmonophloia*	Nesting			750797	6406512	38	0-10	Alive	
763	2018-09-02	*E. salmonophloia*	Nesting			750794	6406509	39	0-10	Alive	
764	2018-09-02	*E. salmonophloia*	Nesting			750788	6406499	31	10-15	Alive	
765	2018-09-02	*E. salmonophloia*	Nesting			750783	6406495	31	10-15	Alive	
766	2018-09-02	*E. salmonophloia*	Nesting			750778	6406509	37	10-15	Alive	
767	2018-09-02	*E. salmonophloia*	Nesting			750747	6406489	33	10-15	Alive	
768	2018-09-02	*E. salmonophloia*	Nesting			750720	6406496	33	10-15	Alive	
769	2018-09-02	*E. salmonophloia*	Nesting			750716	6406480	45	15-20	Alive	
770	2018-09-02	*E. salmonophloia*	Nesting			750659	6406485	46	10-15	Alive	
771	2018-09-02	*E. salmonophloia*	Nesting			750652	6406491	32	10-15	Alive	
772	2018-09-02	*E. salmonophloia*	Nesting			750651	6406496	35	10-15	Alive	
773	2018-09-02	*E. salmonophloia*	Nesting			750641	6406493	40	10-15	Alive	
774	2018-09-02	*E. salmonophloia*	Nesting			750580	6406496	35	10-15	Alive	
775	2018-09-02	*E. salmonophloia*	Nesting			750562	6406477	41	15-20	Alive	
776	2018-09-02	*E. salmonophloia*	Nesting			750569	6406490	38	10-15	Alive	
777	2018-09-02	*E. salmonophloia*	Nesting			750553	6406492	34	15-20	Alive	
778	2018-09-02	*E. salmonophloia*	Nesting			750539	6406474	45	15-20	Alive	
779	2018-09-02	*E. salmonophloia*	Nesting			750535	6406483	34	15-20	Alive	
780	2018-09-02	*E. salmonophloia*	Nesting			750497	6406488	42	15-20	Alive	
781	2018-09-02	*E. salmonophloia*	Nesting			750529	6406567	33	15-20	Alive	
782	2018-09-02	*E. salmonophloia*	Nesting			750524	6406562	41	10-15	Alive	
783	2018-09-02	*E. salmonophloia*	Nesting			750646	6406564	53	10-15	Alive	
784	2018-09-02	*E. salmonophloia*	Nesting			750835	6406603	37	10-15	Alive	
785	2018-09-02	*E. salmonophloia*	Nesting			750834	6406603	46	10-15	Alive	
786	2018-09-02	*E. salmonophloia*	Nesting			750908	6406598	52	10-15	Alive	
787	2018-09-02	*E. salmonophloia*	Nesting			750962	6406574	53	0-10	Alive	
788	2018-09-02	*E. urna*	Nesting			751110	6406594	51	10-15	Alive	
789	2018-09-02	*E. urna*	Nesting			751102	6406598	31	10-15	Alive	
790	2018-09-02	*E. urna*	Nesting			751133	6406596	39	10-15	Alive	
791	2018-09-02	*E. urna*	Nesting			751152	6406600	38	15-20	Alive	
792	2018-09-02	*E. urna*	Nesting			751159	6406610	42	15-20	Alive	
793	2018-09-02	*E. urna*	Nesting			751176	6406606	31	0-10	Alive	
794	2018-09-02	*E. urna*	Nesting			751196	6406611	45	10-15	Alive	
795	2018-09-02	*E. urna*	Nesting			751200	6406620	31	0-10	Alive	
796	2018-09-02	*E. urna*	Nesting			751214	6406608	55	10-15	Alive	
797	2018-09-02	*E. urna*	Nesting			751245	6406593	39	10-15	Alive	
798	2018-09-02	*E. urna*	Nesting			751259	6406590	35	10-15	Alive	
799	2018-09-02	*E. urna*	Nesting			751283	6406580	39	10-15	Alive	
800	2018-09-02	*E. urna*	Nesting			751348	6406523	30	0-10	Alive	
801	2018-09-02	*E. urna*	Nesting			751377	6406524	34	0-10	Alive	
802	2018-09-02	*E. urna*	Nesting			751562	6406514	54	0-10	Alive	
803	2018-09-02	*E. urna*	Nesting			751195	6406636	33	10-15	Alive	
804	2018-09-02	*E. urna*	Nesting			751166	6406624	33	0-10	Alive	
805	2018-09-02	*E. urna*	Nesting			751155	6406647	44	10-15	Alive	
806	2018-09-02	*E. urna*	Nesting			751129	6406624	38	10-15	Alive	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
807	2018-09-02	*E. urna*	Nesting			751126	6406628	40	10-15	Alive	
808	2018-09-02	*E. urna*	Nesting			751122	6406623	40	10-15	Alive	
809	2018-09-02	*E. urna*	Nesting			751123	6406617	45	10-15	Alive	
810	2018-09-02	*E. urna*	Nesting			751086	6406619	37	10-15	Alive	
811	2018-09-02	*E. urna*	Nesting			751079	6406607	35	15-20	Alive	
812	2018-09-02	*E. urna*	Nesting			751076	6406611	33	10-15	Alive	
813	2018-09-02	*E. urna*	Nesting			751057	6406591	37	10-15	Alive	
814	2018-09-02	*E. urna*	Nesting			751041	6406592	45	10-15	Alive	
815	2018-09-02	*E. urna*	Nesting			751036	6406583	55	15-20	Alive	
816	2018-09-02	*E. urna*	Nesting			751029	6406606	41	15-20	Alive	
817	2018-09-02	*E. urna*	Nesting			751026	6406608	31	10-15	Alive	
818	2018-09-02	*E. salmonophloia*	Nesting			750888	6406615	43	10-15	Alive	
819	2018-09-02	*E. salmonophloia*	Nesting			750602	6406584	45	0-10	Alive	
820	2018-09-02	*E. salmonophloia*	Nesting			750525	6406594	34	10-15	Alive	
821	2018-09-02	*E. longicornis*	Nesting			750536	6406671	41	10-15	Alive	
822	2018-09-02	*E. salmonophloia*	Nesting			750585	6406652	35	10-15	Alive	
823	2018-09-02	*E. transcontinentalis*	Nesting			751142	6406694	33	0-10	Alive	
824	2018-09-03	*E. salmonophloia*	Nesting			753720	6403099	43	10-15	Alive	
825	2018-09-03	*E. salmonophloia*	Nesting			753743	6403202	30	10-15	Alive	
826	2018-09-03	*E. urna*	Nesting			753737	6403305	35	10-15	Alive	
827	2018-09-03	*E. salmonophloia*	Nesting			753745	6404062	32	0-10	Alive	
828	2018-09-03	*E. urna*	Nesting			753715	6404180	31	0-10	Alive	
829	2018-09-03	*E. salmonophloia*	Nesting			753688	6404371	38	10-15	Alive	
830	2018-09-03	*E. salmonophloia*	Nesting	Yes		753717	6404598	47	10-15	Alive	
831	2018-09-03	*E. transcontinentalis*	Nesting			752849	6407710	40	0-10	Alive	
832	2018-09-03	*E. transcontinentalis*	Nesting			752809	6407751	41	10-15	Alive	
833	2018-09-03	*E. transcontinentalis*	Nesting			752780	6407827	39	10-15	Alive	
834	2018-09-03	*E. transcontinentalis*	Nesting			752806	6407820	43	10-15	Alive	
835	2018-09-03	*E. transcontinentalis*	Nesting			752811	6407826	41	10-15	Alive	
836	2018-09-03	*E. transcontinentalis*	Nesting			752824	6407806	49	10-15	Alive	
837	2018-09-03	*E. transcontinentalis*	Nesting			752839	6407723	36	0-10	Alive	
838	2018-09-03	*E. transcontinentalis*	Nesting			752842	6407715	35	0-10	Alive	
839	2018-09-03	*E. salmonophloia*	Nesting			753720	6405309	47	0-10	Alive	
840	2018-09-03	*E. urna*	Nesting			753729	6405216	30	0-10	Alive	
841	2018-09-03	*E. salmonophloia*	Nesting			753730	6404801	37	0-10	Alive	
842	2018-09-03	*E. salmonophloia*	Nesting			753737	6404624	32	0-10	Alive	
843	2018-09-03	*E. salmonophloia*	Nesting			753732	6404530	32	0-10	Alive	
845	2018-09-03	*E. transcontinentalis*	Nesting			753744	6404407	32	10-15	Alive	
847	2018-09-03	*E. salmonophloia*	Nesting			753746	6403203	38	10-15	Alive	
848	2018-09-03	*E. transcontinentalis*	Nesting			752785	6407706	37	10-15	Alive	
849	2018-09-03	*E. transcontinentalis*	Nesting	Yes		752832	6407672	32	10-15	Alive	
850	2018-09-03	*E. urna*	Nesting			753665	6405469	51	10-15	Alive	
851	2018-09-03	*E. salmonophloia*	Nesting			753673	6405260	41	0-10	Alive	
852	2018-09-03	*E. salmonophloia*	Nesting			753666	6405229	33	10-15	Alive	
853	2018-09-03	*E. salmonophloia*	Nesting			753664	6405218	59	0-10	Alive	
854	2018-09-03	*E. urna*	Nesting			753697	6403334	30	0-10	Alive	
855	2018-09-03	*E. urna*	Nesting			753708	6403324	46	10-15	Alive	
856	2018-09-03	*E. urna*	Nesting			753694	6403317	33	0-10	Alive	
857	2018-09-03	*E. salmonophloia*	Nesting			753683	6403112	30	10-15	Alive	
858	2018-09-03	*E. salmonophloia*	Nesting			753704	6403106	34	10-15	Alive	
859	2018-09-03	*E. salmonophloia*	Nesting			753709	6403097	32	0-10	Alive	
860	2018-09-03	*E. salmonophloia*	Nesting			753699	6402984	49	0-10	Alive	
861	2018-09-03	*E. urna*	Nesting			751626	6405180	59	15-20	Alive	
862	2018-09-03	*E. urna*	Nesting			751626	6405186	37	10-15	Alive	
863	2018-09-03	*E. urna*	Nesting			751621	6405184	53	10-15	Alive	
864	2018-09-03	*E. urna*	Nesting	Yes		751548	6405201	44	0-10	Alive	
865	2018-09-03	*E. salmonophloia*	Nesting			751452	6405208	35	0-10	Alive	

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866	2018-09-03	*E. salmonophloia*	Nesting			751443	6405196	32	10-15	Alive	
867	2018-09-03	*E. salmonophloia*	Nesting			751286	6405196	34	10-15	Alive	
868	2018-09-03	*E. salmonophloia*	Nesting			751379	6405285	35	0-10	Alive	
869	2018-09-03	*E. salmonophloia*	Nesting			751384	6405282	33	10-15	Alive	
870	2018-09-03	*E. urna*	Nesting			751564	6405275	44	15-20	Alive	
871	2018-09-03	*E. salmonophloia*	Nesting			751432	6405301	33	10-15	Alive	
872	2018-09-03	E. salmonophloia	Nesting			751136	6405316	52	10-15	Alive	
873	2018-09-03	*E. salmonophloia*	Nesting			751457	6405372	32	0-10	Alive	
874	2018-09-03	*E. urna*	Nesting			751535	6405382	46	15-20	Alive	
875	2018-09-03	*E. urna*	Nesting			751588	6405383	50	10-15	Alive	
876	2018-09-03	*E. urna*	Nesting			751121	6405408	34	10-15	Alive	
877	2018-09-03	*E. urna*	Nesting			751086	6405476	31	10-15	Alive	
878	2018-09-03	*E. urna*	Nesting			751109	6405482	34	10-15	Alive	
879	2018-09-03	*E. urna*	Nesting			751342	6405459	31	10-15	Alive	
880	2018-09-03	*E. urna*	Nesting			751392	6405469	36	10-15	Alive	
881	2018-09-03	*E. salmonophloia*	Nesting			751438	6405237	39	10-15	Alive	
882	2018-09-03	*E. salmonophloia*	Nesting			751437	6405232	35	10-15	Alive	
883	2018-09-03	*E. salmonophloia*	Nesting			751307	6405227	31	10-15	Alive	
884	2018-09-03	*E. salmonophloia*	Nesting			751194	6405274	30	0-10	Alive	
885	2018-09-03	*E. salmonophloia*	Nesting			751315	6405243	30	10-15	Alive	
886	2018-09-03	*E. salmonophloia*	Nesting			751400	6405244	35	0-10	Alive	
887	2018-09-03	*E. salmonophloia*	Nesting			751431	6405249	34	0-10	Alive	
888	2018-09-03	*E. salmonophloia*	Nesting			751437	6405259	31	0-10	Alive	
889	2018-09-03	*E. salmonophloia*	Nesting			751488	6405257	31	0-10	Alive	
890	2018-09-03	*E. salmonophloia*	Nesting			751439	6405334	33	0-10	Alive	
891	2018-09-03	*E. urna*	Nesting			751190	6405335	34	0-10	Alive	
892	2018-09-03	*E. salmonophloia*	Nesting			751166	6405341	43	0-10	Alive	
893	2018-09-03	E. urna	Nesting			751115	6405350	36	10-15	Alive	
894	2018-09-03	*E. salmonophloia*	Nesting			751455	6405360	32	0-10	Alive	
895	2018-09-03	*E. urna*	Nesting			751381	6405440	31	10-15	Alive	
896	2018-09-03	*E. urna*	Nesting			751126	6405415	38	10-15	Alive	
897	2018-09-03	*E. urna*	Nesting			751579	6405476	32	10-15	Alive	
898	2018-09-03	*E. salmonophloia*	Nesting			751222	6405224	34	10-15	Alive	
899	2018-09-03	*E. salmonophloia*	Nesting			751418	6405269	30	10-15	Alive	
900	2018-09-03	E. urna	Nesting			751112	6405331	32	10-15	Alive	
901	2018-09-03	E. salmonophloia	Nesting			751112	6405330	34	0-10	Alive	
902	2018-09-03	*E. urna*	Nesting			751103	6405400	35	0-10	Alive	
903	2018-09-03	*E. salmonophloia*	Nesting			751463	6405416	36	10-15	Alive	
904	2018-09-03	*E. urna*	Nesting			751058	6405465	30	0-10	Alive	
905	2018-09-03	*E. urna*	Nesting			751074	6405469	31	10-15	Alive	
906	2018-09-03	*E. urna*	Nesting			751167	6405461	30	10-15	Alive	
907	2018-09-03	*E. urna*	Nesting			751329	6405452	31	10-15	Alive	
908	2018-09-04	*E. urna*	Nesting			751432	6405493	32	10-15	Alive	
909	2018-09-04	*E. urna*	Nesting			751423	6405492	33	10-15	Alive	
910	2018-09-04	*E. urna*	Nesting			751348	6405486	55	10-15	Alive	
911	2018-09-04	*E. urna*	Nesting			751127	6405552	36	10-15	Alive	
912	2018-09-04	*E. urna*	Nesting			751136	6405551	32	10-15	Alive	
913	2018-09-04	*E. urna*	Nesting			751159	6405534	32	0-10	Alive	
914	2018-09-04	*E. urna*	Nesting			751266	6405562	39	10-15	Alive	
915	2018-09-04	*E. urna*	Nesting			751182	6405553	37	0-10	Alive	
916	2018-09-04	*E. salmonophloia*	Nesting			750954	6405688	43	10-15	Alive	
917	2018-09-04	*E. urna*	Nesting			751206	6405692	44	10-15	Alive	
918	2018-09-04	*E. urna*	Nesting			751587	6405709	50	0-10	Alive	
919	2018-09-04	*E. urna*	Nesting			751224	6405491	30	10-15	Alive	
920	2018-09-04	*E. urna*	Nesting			751137	6405538	35	10-15	Alive	
921	2018-09-04	*E. urna*	Nesting			751275	6405531	33	10-15	Alive	
922	2018-09-04	*E. urna*	Nesting			751532	6405588	48	15-20	Alive	

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923	2018-09-04	*E. urna*	Nesting			751216	6405560	41	10-15	Alive	
924	2018-09-04	*E. urna*	Nesting			751451	6405530	43	10-15	Alive	
925	2018-09-04	*E. urna*	Nesting			751378	6405532	39	0-10	Alive	
926	2018-09-04	*E. urna*	Nesting			751318	6405524	35	10-15	Alive	
927	2018-09-04	*E. urna*	Nesting			751287	6405512	37	0-10	Alive	
928	2018-09-04	*E. urna*	Nesting			751183	6405508	32	0-10	Alive	
929	2018-09-04	*E. urna*	Nesting			751127	6405511	31	10-15	Alive	
930	2018-09-04	*E. urna*	Nesting			751105	6405514	31	10-15	Alive	
931	2018-09-04	*E. urna*	Nesting			751101	6405537	37	10-15	Alive	
932	2018-09-04	*E. urna*	Nesting			751106	6405537	31	10-15	Alive	
933	2018-09-04	*E. urna*	Nesting			751105	6405528	31	10-15	Alive	
934	2018-09-04	*E. urna*	Nesting			751126	6405527	45	0-10	Alive	
935	2018-09-04	*E. urna*	Nesting			751173	6405523	32	10-15	Alive	
936	2018-09-04	*E. urna*	Nesting			751186	6405516	35	10-15	Alive	
937	2018-09-04	*E. urna*	Nesting			751280	6405532	31	0-10	Alive	
938	2018-09-04	*E. urna*	Nesting			751239	6405582	41	10-15	Alive	
939	2018-09-04	*E. salmonophloia*	Nesting			750895	6405665	33	10-15	Alive	
940	2018-09-04	*E. salmonophloia*	Nesting			750935	6405662	32	10-15	Alive	
941	2018-09-04	*E. urna*	Nesting			751086	6405666	50	15-20	Alive	
942	2018-09-04	*E. urna*	Nesting			751280	6405688	45	15-20	Alive	
943	2018-09-04	*E. urna*	Nesting			751540	6405665	32	10-15	Alive	
944	2018-09-05	*E. transcontinentalis*	Nesting			751032	6406718	48	10-15	Alive	
945	2018-09-05	*E. longicornis*	Nesting			750491	6406746	71	15-20	Alive	
946	2018-09-05	*E. salmonophloia*	Nesting			750602	6406764	51	10-15	Alive	
947	2018-09-05	*E. salmonophloia*	Nesting			750702	6406775	39	10-15	Alive	
948	2018-09-05	*E. transcontinentalis*	Nesting			750874	6406836	34	10-15	Alive	
949	2018-09-05	*E. transcontinentalis*	Nesting			751662	6404374	33	10-15	Alive	
950	2018-09-05	*E. urna*	Nesting			751667	6404354	58	15-20	Alive	
951	2018-09-05	*E. urna*	Nesting			752021	6403581	57	10-15	Alive	
952	2018-09-05	*E. urna*	Nesting			752106	6403508	51	10-15	Alive	
953	2018-09-05	*E. urna*	Nesting			752228	6403423	74	10-15	Alive	
954	2018-09-05	*E. urna*	Nesting			752263	6403403	54	10-15	Alive	
955	2018-09-05	*E. longicornis*	Nesting			752404	6403306	53	15-20	Alive	
956	2018-09-05	*E. urna*	Nesting			752448	6403280	48	10-15	Alive	
957	2018-09-05	*E. transcontinentalis*	Nesting			751118	6406712	43	10-15	Alive	
958	2018-09-05	*E. salmonophloia*	Nesting			750607	6406709	57	10-15	Alive	
959	2018-09-05	*E. salmonophloia*	Nesting	Yes		750581	6406799	67	10-15	Alive	
960	2018-09-05	*E. transcontinentalis*	Nesting	Yes		750992	6406760	55	15-20	Alive	
961	2018-09-05	*E. transcontinentalis*	Nesting			750997	6406782	70	15-20	Alive	
962	2018-09-05	*E. salmonophloia*	Nesting			750527	6406842	34	10-15	Alive	
963	2018-09-05	*E. transcontinentalis*	Nesting			751016	6406699	34	0-10	Alive	
964	2018-09-05	*E. transcontinentalis*	Nesting			751019	6406703	35	10-15	Alive	
965	2018-09-05	*E. transcontinentalis*	Nesting			751007	6406730	35	10-15	Alive	
966	2018-08-29	Indet. Stag	Nesting	Yes		751719	6405722	55	10-15	Dead	
967	2018-08-29	Indet. Stag	Nesting			751753	6405679	52	15-20	Dead	
968	2018-08-29	Indet. Stag	Nesting	Yes		751948	6405579	40	10-15	Dead	
969	2018-08-29	Indet. Stag	Nesting	Yes		751906	6405760	63	10-15	Dead	
970	2018-08-30	Indet. Stag	Nesting	Yes		751875	6406499	35	10-15	Dead	
971	2018-08-30	Indet. Stag	Nesting	Yes		751559	6404569	49	0-10	Dead	
972	2018-08-30	Indet. Stag	Nesting			751534	6404594	42	0-10	Dead	
973	2018-08-30	Indet. Stag	Nesting			751384	6404495	35	10-15	Dead	
974	2018-08-31	Indet. Stag	Nesting			750876	6405815	35	0-10	Dead	
975	2018-08-31	Indet. Stag	Nesting			751370	6405846	35	0-10	Dead	
976	2018-08-31	Indet. Stag	Nesting			751629	6405876	43	10-15	Dead	
977	2018-08-31	Indet. Stag	Nesting	Yes		750960	6405676	32	0-10	Dead	
978	2018-08-31	Indet. Stag	Nesting	Yes		751106	6405990	39	0-10	Dead	
979	2018-08-31	Indet. Stag	Nesting			751419	6405952	45	0-10	Dead	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
980	2018-08-31	Indet. Stag	Nesting			751622	6405843	34	10-15	Dead	
981	2018-08-31	Indet. Stag	Nesting	Yes		751628	6405832	63	10-15	Dead	
982	2018-08-31	Indet. Stag	Nesting	Yes		750906	6405698	45	0-10	Dead	
983	2018-08-31	Indet. Stag	Nesting			751178	6405970	38	0-10	Dead	
984	2018-08-31	Indet. Stag	Nesting			751273	6405993	33	0-10	Dead	
985	2018-08-31	Indet. Stag	Nesting			751478	6404815	35	0-10	Dead	
986	2018-08-31	Indet. Stag	Nesting			751618	6404913	58	10-15	Dead	
987	2018-09-01	Indet. Stag	Nesting			751616	6406017	32	10-15	Dead	
988	2018-09-01	Indet. Stag	Nesting			751532	6406070	36	0-10	Dead	
989	2018-09-01	Indet. Stag	Nesting			751557	6406063	35	0-10	Dead	
990	2018-09-01	Indet. Stag	Nesting			751354	6406334	38	10-15	Dead	
991	2018-09-01	Indet. Stag	Nesting			751370	6406373	35	10-15	Dead	
992	2018-09-01	Indet. Stag	Nesting			751369	6406339	40	10-15	Dead	
993	2018-09-01	Indet. Stag	Nesting			750517	6406191	41	10-15	Dead	
994	2018-09-01	Indet. Stag	Nesting	Yes		750636	6406253	31	0-10	Dead	
995	2018-09-01	Indet. Stag	Nesting			750646	6406327	36	0-10	Dead	
996	2018-09-01	Indet. Stag	Nesting			751336	6406366	31	0-10	Dead	
997	2018-09-02	Indet. Stag	Nesting	Yes		751524	6404967	67	0-10	Dead	
998	2018-09-02	Indet. Stag	Nesting			751601	6405033	43	10-15	Dead	
999	2018-09-02	Indet. Stag	Nesting			751612	6405035	44	10-15	Dead	
1000	2018-09-02	Indet. Stag	Nesting			751579	6405044	32	10-15	Dead	
1001	2018-09-02	Indet. Stag	Nesting			751578	6405045	32	10-15	Dead	
1002	2018-09-02	Indet. Stag	Nesting	Yes		750766	6406004	61	0-10	Dead	
1004	2018-09-02	Indet. Stag	Nesting			751588	6405053	31	0-10	Dead	
1005	2018-09-02	Indet. Stag	Nesting	Yes		751568	6405048	32	0-10	Dead	
1006	2018-09-02	Indet. Stag	Nesting	Yes		751469	6405095	88	10-15	Dead	
1007	2018-09-02	Indet. Stag	Nesting	Yes		751633	6405091	40	10-15	Dead	
1008	2018-09-02	Indet. Stag	Nesting			751333	6406413	31	0-10	Dead	
1009	2018-09-02	Indet. Stag	Nesting			751089	6406426	32	0-10	Dead	
1010	2018-09-02	Indet. Stag	Nesting			750834	6406636	40	10-15	Dead	
1011	2018-09-02	Indet. Stag	Nesting			750721	6406646	36	0-10	Dead	
1012	2018-09-02	Indet. Stag	Nesting	Yes		751292	6406573	36	0-10	Dead	
1013	2018-09-02	Indet. Stag	Nesting	Yes		750856	6406639	45	0-10	Dead	
1014	2018-09-02	Indet. Stag	Nesting			751381	6406471	32	0-10	Dead	
1015	2018-09-02	Indet. Stag	Nesting			750861	6406583	31	0-10	Dead	
1016	2018-09-02	Indet. Stag	Nesting			750859	6406588	37	0-10	Dead	
1017	2018-09-02	Indet. Stag	Nesting			751170	6406612	30	0-10	Dead	
1018	2018-09-02	Indet. Stag	Nesting			751239	6406610	35	0-10	Dead	
1019	2018-09-02	Indet. Stag	Nesting	Yes		750833	6406615	55	0-10	Dead	
1020	2018-09-02	Indet. Stag	Nesting			750710	6406628	47	0-10	Dead	
1021	2018-09-02	Indet. Stag	Nesting			750593	6406577	37	10-15	Dead	
1022	2018-09-02	Indet. Stag	Nesting			750773	6406717	47	0-10	Dead	
1024	2018-09-03	Indet. Stag	Nesting	Yes		753711	6403593	42	0-10	Dead	
1025	2018-09-03	Indet. Stag	Nesting	Yes		753711	6403743	39	0-10	Dead	
1026	2018-09-03	Indet. Stag	Nesting	Yes		753748	6403914	70	0-10	Dead	
1027	2018-09-03	Indet. Stag	Nesting	Yes		753712	6404170	41	0-10	Dead	
1028	2018-09-03	Indet. Stag	Nesting	Yes		753709	6404179	55	0-10	Dead	
1029	2018-09-03	Indet. Stag	Nesting	Yes		753665	6405983	34	0-10	Dead	
1030	2018-09-03	Indet. Stag	Nesting			753743	6403880	53	0-10	Dead	
1031	2018-09-03	Indet. Stag	Nesting			753777	6403801	51	0-10	Dead	
1032	2018-09-03	Indet. Stag	Nesting	Yes		752814	6407704	50	0-10	Dead	
1033	2018-09-03	Indet. Stag	Nesting	Yes		752840	6407672	37	10-15	Dead	
1034	2018-09-03	Indet. Stag	Nesting			753672	6404648	63	10-15	Dead	
1035	2018-09-03	Indet. Stag	Nesting			753683	6403797	35	15-20	Dead	
1036	2018-09-03	Indet. Stag	Nesting			753707	6403100	32	10-15	Dead	
1037	2018-09-03	Indet. Stag	Nesting	Yes		751524	6405263	52	0-10	Dead	
1038	2018-09-03	Indet. Stag	Nesting	Yes		751561	6405279	46	0-10	Dead	

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1039	2018-09-03	Indet. Stag	Nesting			751583	6405287	49	10-15	Dead	
1040	2018-09-03	Indet. Stag	Nesting	Yes		751582	6405306	42	0-10	Dead	
1041	2018-09-03	Indet. Stag	Nesting			751577	6405315	58	15-20	Dead	
1042	2018-09-03	Indet. Stag	Nesting	Yes		751527	6405313	56	10-15	Dead	
1043	2018-09-03	Indet. Stag	Nesting	Yes		751516	6405313	59	15-20	Dead	
1044	2018-09-03	Indet. Stag	Nesting			751611	6405376	35	10-15	Dead	
1045	2018-09-03	Indet. Stag	Nesting	Yes		751623	6405373	42	0-10	Dead	
1046	2018-09-03	Indet. Stag	Nesting	Yes		751605	6405392	46	10-15	Dead	
1047	2018-09-03	Indet. Stag	Nesting			751528	6405489	32	10-15	Dead	
1048	2018-09-03	Indet. Stag	Nesting	Yes		751628	6405222	54	10-15	Dead	
1049	2018-09-03	Indet. Stag	Nesting			751538	6405210	43	10-15	Dead	
1050	2018-09-03	Indet. Stag	Nesting	Yes		751530	6405224	35	10-15	Dead	
1051	2018-09-03	Indet. Stag	Nesting	Yes		751601	6405226	57	15-20	Dead	
1052	2018-09-03	Indet. Stag	Nesting			751613	6405244	51	0-10	Dead	
1053	2018-09-03	Indet. Stag	Nesting			751623	6405251	40	0-10	Dead	
1054	2018-09-03	Indet. Stag	Nesting	Yes		751591	6405344	41	0-10	Dead	
1055	2018-09-03	Indet. Stag	Nesting			751589	6405335	34	0-10	Dead	
1056	2018-09-03	Indet. Stag	Nesting			751559	6405357	38	10-15	Dead	
1057	2018-09-03	Indet. Stag	Nesting	Yes		751564	6405345	42	10-15	Dead	
1058	2018-09-03	Indet. Stag	Nesting			751543	6405339	36	0-10	Dead	
1059	2018-09-03	Indet. Stag	Nesting	Yes		751546	6405337	30	0-10	Dead	
1060	2018-09-03	Indet. Stag	Nesting			751510	6405345	40	10-15	Dead	
1061	2018-09-03	Indet. Stag	Nesting			751513	6405342	36	10-15	Dead	
1062	2018-09-03	Indet. Stag	Nesting			751575	6405369	38	10-15	Dead	
1063	2018-09-03	Indet. Stag	Nesting			751587	6405373	36	10-15	Dead	
1064	2018-09-03	Indet. Stag	Nesting			751595	6405357	31	0-10	Dead	
1065	2018-09-03	Indet. Stag	Nesting			751626	6405365	37	0-10	Dead	
1066	2018-09-03	Indet. Stag	Nesting	Yes		751635	6405416	46	0-10	Dead	
1067	2018-09-03	Indet. Stag	Nesting	Yes		751589	6405465	45	0-10	Dead	
1068	2018-09-03	Indet. Stag	Nesting	Yes		751551	6405202	38	0-10	Dead	
1069	2018-09-03	Indet. Stag	Nesting	Yes		751547	6405210	76	10-15	Dead	
1070	2018-09-03	Indet. Stag	Nesting	Yes		751551	6405256	75	10-15	Dead	
1071	2018-09-03	Indet. Stag	Nesting	Yes		751623	6405337	35	0-10	Dead	
1072	2018-09-03	Indet. Stag	Nesting			751597	6405309	35	0-10	Dead	
1073	2018-09-03	Indet. Stag	Nesting	Yes		751608	6405322	45	0-10	Dead	
1074	2018-09-03	Indet. Stag	Nesting	Yes		751543	6405327	42	0-10	Dead	
1075	2018-09-03	Indet. Stag	Nesting			751457	6405335	38	0-10	Dead	
1076	2018-09-03	Indet. Stag	Nesting	Yes		751462	6405370	31	0-10	Dead	
1077	2018-09-03	Indet. Stag	Nesting	Yes		751592	6405375	41	0-10	Dead	
1078	2018-09-03	Indet. Stag	Nesting	Yes		751624	6405373	43	10-15	Dead	
1079	2018-09-03	Indet. Stag	Nesting			751621	6405373	42	10-15	Dead	
1081	2018-09-04	Indet. Stag	Nesting			751098	6405678	55	10-15	Dead	
1082	2018-09-04	Indet. Stag	Nesting			751195	6405685	36	10-15	Dead	
1083	2018-09-04	Indet. Stag	Nesting			751175	6405517	32	10-15	Dead	
1084	2018-09-04	Indet. Stag	Nesting	Yes		751592	6405589	28	0-10	Dead	
1085	2018-09-04	Indet. Stag	Nesting	Yes		751072	6405584	61	10-15	Dead	
1086	2018-09-04	Indet. Stag	Nesting	Yes		751087	6405669	38	10-15	Dead	
1087	2018-09-04	Indet. Stag	Nesting	Yes		751086	6405671	30	0-10	Dead	
1088	2018-09-04	Indet. Stag	Nesting	Yes		751172	6405663	45	0-10	Dead	
1089	2018-09-04	Indet. Stag	Nesting			751358	6405527	41	0-10	Dead	
1090	2018-09-04	Indet. Stag	Nesting			751539	6405627	44	0-10	Dead	
1091	2018-09-04	Indet. Stag	Nesting			751123	6405594	44	10-15	Dead	
1092	2018-09-04	Indet. Stag	Nesting			751079	6405666	39	15-20	Dead	
1093	2018-09-04	Indet. Stag	Nesting	Yes		751140	6405665	46	0-10	Dead	
1094	2018-09-04	Indet. Stag	Nesting	Yes		751150	6405669	51	0-10	Dead	
1095	2018-09-05	Indet. Stag	Nesting	Yes		751825	6404068	54	0-10	Dead	
1096	2018-09-05	Indet. Stag	Nesting	Yes		751018	6406694	42	0-10	Dead	

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1097	2018-09-05	Indet. Stag	Nesting	Yes		750857	6406763	44	0-10	Dead	
1098	2018-08-29	*E. urna*	Nesting	Yes		751928	6405756	52	15-20	Dieback affected	
1099	2018-08-29	*E. urna*	Nesting	Yes		751925	6405770	56	15-20	Dieback affected	
1100	2018-08-29	*E. salmonophloia*	Nesting	Yes		751798	6406050	49	10-15	Dieback affected	
1101	2018-08-30	*E. salmonophloia*	Nesting			751334	6404514	30	10-15	Dieback affected	
1102	2018-08-30	*E. salmonophloia*	Nesting			751448	6404544	31	10-15	Dieback affected	
1103	2018-08-31	*E. salmonophloia*	Nesting			750634	6405945	35	10-15	Dieback affected	
1104	2018-08-31	*E. salmonophloia*	Nesting			750706	6405950	38	10-15	Dieback affected	
1105	2018-08-29	*E. urna*	Nesting	Yes		751961	6405633	62	0-10	Resprouting (fire)	
1106	2018-08-31	*E. salmonophloia*	Nesting			751014	6405949	40	0-10	Resprouting (fire)	
1107	2018-08-31	*E. salmonophloia*	Nesting			751066	6405960	45	10-15	Resprouting (fire)	
1108	2018-08-31	*E. salmonophloia*	Nesting			751067	6405963	39	0-10	Resprouting (fire)	
1109	2018-08-31	*E. urna*	Nesting	Yes		751103	6405996	41	0-10	Resprouting (fire)	
1110	2018-08-31	*E. urna*	Nesting	Yes		751278	6405961	42	0-10	Resprouting (fire)	
1111	2018-08-31	*E. urna*	Nesting			751367	6405973	35	10-15	Resprouting (fire)	
1112	2018-08-31	*E. urna*	Nesting			751378	6405979	34	0-10	Resprouting (fire)	
1113	2018-08-31	*E. urna*	Nesting			751356	6405953	40	0-10	Resprouting (fire)	
1114	2018-08-31	*E. urna*	Nesting			751135	6405949	31	0-10	Resprouting (fire)	
1115	2018-08-31	*E. salmonophloia*	Nesting			751048	6405902	38	10-15	Resprouting (fire)	
1116	2018-08-31	*E. salmonophloia*	Nesting			751003	6405881	33	0-10	Resprouting (fire)	
1117	2018-08-31	*E. salmonophloia*	Nesting			750944	6405901	30	0-10	Resprouting (fire)	
1118	2018-08-31	*E. salmonophloia*	Nesting			750858	6405920	42	0-10	Resprouting (fire)	
1119	2018-08-31	*E. salmonophloia*	Nesting			750849	6405924	35	0-10	Resprouting (fire)	
1120	2018-08-31	*E. salmonophloia*	Nesting			750736	6405884	30	0-10	Resprouting (fire)	
1121	2018-08-31	*E. salmonophloia*	Nesting			750739	6405886	48	10-15	Resprouting (fire)	
1122	2018-08-31	*E. salmonophloia*	Nesting			750757	6405877	32	0-10	Resprouting (fire)	
1123	2018-08-31	*E. salmonophloia*	Nesting			750755	6405795	32	0-10	Resprouting (fire)	
1124	2018-08-31	*E. salmonophloia*	Nesting			750786	6405798	36	10-15	Resprouting (fire)	
1125	2018-08-31	*E. salmonophloia*	Nesting			750871	6405784	31	0-10	Resprouting (fire)	
1126	2018-08-31	*E. salmonophloia*	Nesting			750901	6405772	43	0-10	Resprouting (fire)	
1127	2018-08-31	*E. salmonophloia*	Nesting			750976	6405765	31	0-10	Resprouting (fire)	
1128	2018-08-31	*E. salmonophloia*	Nesting			751040	6405781	48	10-15	Resprouting (fire)	
1129	2018-08-31	*E. salmonophloia*	Nesting			751058	6405781	60	15-20	Resprouting (fire)	
1130	2018-08-31	*E. salmonophloia*	Nesting			751277	6405831	35	10-15	Resprouting (fire)	
1131	2018-08-31	*E. salmonophloia*	Nesting			751289	6405821	35	10-15	Resprouting (fire)	
1132	2018-08-31	*E. urna*	Nesting			751317	6405744	48	0-10	Resprouting (fire)	
1133	2018-08-31	*E. urna*	Nesting			751350	6405762	31	0-10	Resprouting (fire)	
1134	2018-08-31	*E. urna*	Nesting	Yes		751506	6405869	61	10-15	Resprouting (fire)	
1135	2018-08-31	*E. urna*	Nesting			751547	6405862	36	10-15	Resprouting (fire)	
1136	2018-08-31	*E. urna*	Nesting			751457	6405839	37	10-15	Resprouting (fire)	
1137	2018-08-31	*E. urna*	Nesting			751457	6405843	31	10-15	Resprouting (fire)	
1138	2018-08-31	*E. urna*	Nesting			751252	6405745	41	10-15	Resprouting (fire)	
1139	2018-08-31	*E. salmonophloia*	Nesting			750912	6405690	41	10-15	Resprouting (fire)	
1140	2018-08-31	E. salmonophloia	Nesting	Yes		750862	6405669	44	0-10	Resprouting (fire)	
1141	2018-08-31	*E. salmonophloia*	Nesting			750874	6405700	58	10-15	Resprouting (fire)	
1142	2018-08-31	*E. urna*	Nesting			751564	6404731	50	10-15	Resprouting (fire)	
1143	2018-08-31	*E. urna*	Nesting			751571	6404747	49	10-15	Resprouting (fire)	
1144	2018-08-31	*E. urna*	Nesting			751574	6404747	55	10-15	Resprouting (fire)	
1145	2018-08-31	*E. urna*	Nesting	Yes		751567	6404747	56	10-15	Resprouting (fire)	
1146	2018-08-31	*E. urna*	Nesting			751539	6404760	35	10-15	Resprouting (fire)	
1147	2018-08-31	*E. salmonophloia*	Nesting			751453	6404757	35	10-15	Resprouting (fire)	
1148	2018-08-31	*E. salmonophloia*	Nesting			751371	6404748	46	10-15	Resprouting (fire)	
1149	2018-08-31	*E. salmonophloia*	Nesting			751322	6404800	33	10-15	Resprouting (fire)	
1150	2018-08-31	*E. salmonophloia*	Nesting			751407	6404830	43	10-15	Resprouting (fire)	
1151	2018-08-31	*E. urna*	Nesting			751518	6404801	63	15-20	Resprouting (fire)	
1152	2018-08-31	*E. salmonophloia*	Nesting			751508	6404886	62	15-20	Resprouting (fire)	
1153	2018-08-31	*E. salmonophloia*	Nesting			751479	6404899	30	10-15	Resprouting (fire)	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
1154	2018-08-31	*E. salmonophloia*	Nesting			751466	6404910	31	10-15	Resprouting (fire)	
1155	2018-08-31	*E. salmonophloia*	Nesting			751406	6404914	36	0-10	Resprouting (fire)	
1156	2018-08-31	*E. salmonophloia*	Nesting			751348	6404897	30	0-10	Resprouting (fire)	
1157	2018-08-31	*E. salmonophloia*	Nesting			751279	6404910	34	0-10	Resprouting (fire)	
1158	2018-09-01	*E. urna*	Nesting			751613	6406062	39	10-15	Resprouting (fire)	
1159	2018-09-01	*E. urna*	Nesting			751537	6406100	38	10-15	Resprouting (fire)	
1160	2018-09-01	*E. urna*	Nesting			751495	6406134	32	0-10	Resprouting (fire)	
1161	2018-09-01	*E. urna*	Nesting			751216	6406103	33	0-10	Resprouting (fire)	
1162	2018-09-01	*E. urna*	Nesting	Yes		751096	6406127	32	0-10	Resprouting (fire)	
1163	2018-09-01	*E. urna*	Nesting	Yes		751079	6406122	55	0-10	Resprouting (fire)	
1164	2018-09-01	*E. urna*	Nesting			751013	6406147	34	0-10	Resprouting (fire)	
1165	2018-09-01	*E. urna*	Nesting			750944	6406151	42	10-15	Resprouting (fire)	
1166	2018-09-01	*E. salmonophloia*	Nesting			750637	6406078	35	0-10	Resprouting (fire)	
1167	2018-09-01	*E. salmonophloia*	Nesting	Yes		750830	6406102	32	0-10	Resprouting (fire)	
1168	2018-09-01	*E. salmonophloia*	Nesting	Yes		750636	6406077	30	0-10	Resprouting (fire)	
1169	2018-09-01	*E. salmonophloia*	Nesting	Yes		750581	6406112	30	0-10	Resprouting (fire)	
1170	2018-09-01	*E. salmonophloia*	Nesting			750658	6406126	39	10-15	Resprouting (fire)	
1171	2018-09-01	*E. salmonophloia*	Nesting			750656	6406133	34	10-15	Resprouting (fire)	
1172	2018-09-01	*E. salmonophloia*	Nesting	Yes		750661	6406140	32	0-10	Resprouting (fire)	
1173	2018-09-01	*E. urna*	Nesting			751106	6406171	32	10-15	Resprouting (fire)	
1174	2018-09-01	*E. urna*	Nesting			751134	6406176	32	0-10	Resprouting (fire)	
1175	2018-09-01	*E. urna*	Nesting			751148	6406177	30	0-10	Resprouting (fire)	
1176	2018-09-01	*E. urna*	Nesting			751168	6406179	35	0-10	Resprouting (fire)	
1177	2018-09-01	*E. urna*	Nesting			751084	6406045	32	0-10	Resprouting (fire)	
1178	2018-09-01	*E. urna*	Nesting			751089	6406034	30	0-10	Resprouting (fire)	
1179	2018-09-01	*E. salmonophloia*	Nesting			750739	6406012	31	0-10	Resprouting (fire)	
1180	2018-09-01	*E. salmonophloia*	Nesting			750728	6406018	32	0-10	Resprouting (fire)	
1181	2018-09-01	*E. urna*	Nesting			751008	6406055	32	0-10	Resprouting (fire)	
1182	2018-09-01	*E. urna*	Nesting			751060	6406082	35	0-10	Resprouting (fire)	
1183	2018-09-01	*E. urna*	Nesting			751122	6406055	33	0-10	Resprouting (fire)	
1184	2018-09-01	*E. urna*	Nesting			751107	6406056	35	0-10	Resprouting (fire)	
1185	2018-09-01	*E. urna*	Nesting	Yes		751135	6406025	37	0-10	Resprouting (fire)	
1186	2018-09-01	*E. urna*	Nesting			751153	6406074	40	0-10	Resprouting (fire)	
1187	2018-09-01	*E. urna*	Nesting			751148	6406075	47	0-10	Resprouting (fire)	
1188	2018-09-01	*E. urna*	Nesting	Yes		751186	6406053	32	0-10	Resprouting (fire)	
1189	2018-09-01	*E. urna*	Nesting			751336	6406100	33	0-10	Resprouting (fire)	
1190	2018-09-01	*E. urna*	Nesting			751416	6406092	32	0-10	Resprouting (fire)	
1191	2018-09-01	*E. urna*	Nesting			751408	6406091	30	0-10	Resprouting (fire)	
1192	2018-09-01	*E. salmonophloia*	Nesting			750741	6406236	39	0-10	Resprouting (fire)	
1193	2018-09-01	*E. salmonophloia*	Nesting			750739	6406235	33	0-10	Resprouting (fire)	
1194	2018-09-01	*E. urna*	Nesting			751480	6406229	31	0-10	Resprouting (fire)	
1195	2018-09-01	*E. urna*	Nesting			751484	6406231	61	10-15	Resprouting (fire)	
1196	2018-09-01	*E. urna*	Nesting			751459	6406219	33	10-15	Resprouting (fire)	
1197	2018-09-01	*E. urna*	Nesting			751444	6406216	33	0-10	Resprouting (fire)	
1198	2018-09-01	*E. urna*	Nesting			751058	6406200	40	10-15	Resprouting (fire)	
1199	2018-09-01	*E. salmonophloia*	Nesting			750798	6406215	32	0-10	Resprouting (fire)	
1200	2018-09-01	*E. salmonophloia*	Nesting			750508	6406212	40	0-10	Resprouting (fire)	
1201	2018-09-01	*E. salmonophloia*	Nesting	Yes		750498	6406207	47	10-15	Resprouting (fire)	
1202	2018-09-01	*E. salmonophloia*	Nesting			750479	6406255	33	10-15	Resprouting (fire)	
1203	2018-09-01	*E. salmonophloia*	Nesting			750509	6406265	34	0-10	Resprouting (fire)	
1204	2018-09-01	*E. salmonophloia*	Nesting			750556	6406262	36	10-15	Resprouting (fire)	
1205	2018-09-01	*E. urna*	Nesting			751007	6406221	40	0-10	Resprouting (fire)	
1206	2018-09-01	*E. urna*	Nesting			751031	6406246	32	0-10	Resprouting (fire)	
1207	2018-09-01	*E. urna*	Nesting	Yes		751126	6406267	31	0-10	Resprouting (fire)	
1208	2018-09-01	*E. urna*	Nesting			751085	6406241	40	0-10	Resprouting (fire)	
1209	2018-09-01	*E. urna*	Nesting			751381	6406259	34	0-10	Resprouting (fire)	
1210	2018-09-01	*E. urna*	Nesting			751515	6406264	36	10-15	Resprouting (fire)	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
1211	2018-09-01	*E. urna*	Nesting			751480	6406267	37	10-15	Resprouting (fire)	
1212	2018-09-01	*E. urna*	Nesting			751393	6406343	46	10-15	Resprouting (fire)	
1213	2018-09-01	*E. urna*	Nesting			751345	6406301	32	0-10	Resprouting (fire)	
1214	2018-09-01	*E. urna*	Nesting			751282	6406310	40	10-15	Resprouting (fire)	
1215	2018-09-01	*E. urna*	Nesting			751203	6406291	47	10-15	Resprouting (fire)	
1216	2018-09-01	*E. urna*	Nesting			751125	6406294	34	0-10	Resprouting (fire)	
1217	2018-09-01	*E. salmonophloia*	Nesting			750851	6406265	32	0-10	Resprouting (fire)	
1218	2018-09-01	*E. salmonophloia*	Nesting			750744	6406316	45	10-15	Resprouting (fire)	
1219	2018-09-01	*E. salmonophloia*	Nesting			750718	6406309	36	10-15	Resprouting (fire)	
1220	2018-09-01	*E. salmonophloia*	Nesting			750655	6406299	36	10-15	Resprouting (fire)	
1221	2018-09-01	*E. salmonophloia*	Nesting			750506	6406306	35	0-10	Resprouting (fire)	
1222	2018-09-01	*E. salmonophloia*	Nesting			750553	6406354	35	0-10	Resprouting (fire)	
1223	2018-09-01	*E. salmonophloia*	Nesting			750558	6406349	48	10-15	Resprouting (fire)	
1224	2018-09-01	*E. salmonophloia*	Nesting			750667	6406331	42	0-10	Resprouting (fire)	
1225	2018-09-01	*E. salmonophloia*	Nesting			750756	6406385	41	0-10	Resprouting (fire)	
1226	2018-09-01	*E. salmonophloia*	Nesting			750925	6406310	31	0-10	Resprouting (fire)	
1227	2018-09-01	*E. urna*	Nesting			751168	6406311	37	0-10	Resprouting (fire)	
1228	2018-09-01	*E. salmonophloia*	Nesting			750759	6406275	56	0-10	Resprouting (fire)	
1229	2018-09-01	*E. salmonophloia*	Nesting			750496	6406303	38	0-10	Resprouting (fire)	
1230	2018-09-01	*E. urna*	Nesting			751177	6406319	33	0-10	Resprouting (fire)	
1231	2018-09-02	*E. urna*	Nesting			751463	6405056	33	0-10	Resprouting (fire)	
1232	2018-09-02	*E. salmonophloia*	Nesting	Yes		751455	6405067	42	0-10	Resprouting (fire)	
1233	2018-09-02	*E. salmonophloia*	Nesting			751455	6405068	30	10-15	Resprouting (fire)	
1234	2018-09-02	*E. salmonophloia*	Nesting			751470	6405100	32	0-10	Resprouting (fire)	
1235	2018-09-02	*E. urna*	Nesting			751594	6405091	51	15-20	Resprouting (fire)	
1236	2018-09-02	*E. urna*	Nesting			751533	6405137	78	10-15	Resprouting (fire)	
1237	2018-09-02	*E. urna*	Nesting			751506	6405145	38	0-10	Resprouting (fire)	
1238	2018-09-02	*E. salmonophloia*	Nesting			751441	6405152	32	0-10	Resprouting (fire)	
1239	2018-09-02	*E. salmonophloia*	Nesting			751387	6405122	31	0-10	Resprouting (fire)	
1240	2018-09-02	*E. salmonophloia*	Nesting			751353	6405127	30	0-10	Resprouting (fire)	
1241	2018-09-02	*E. salmonophloia*	Nesting			751289	6405152	34	0-10	Resprouting (fire)	
1242	2018-09-02	*E. salmonophloia*	Nesting			751285	6405151	40	10-15	Resprouting (fire)	
1243	2018-09-02	*E. salmonophloia*	Nesting			751387	6405145	45	10-15	Resprouting (fire)	
1244	2018-09-02	*E. urna*	Nesting			751523	6405161	47	10-15	Resprouting (fire)	
1245	2018-09-02	*E. urna*	Nesting	Yes		751621	6405166	45	0-10	Resprouting (fire)	
1246	2018-09-02	*E. salmonophloia*	Nesting	Yes		750957	6406375	36	0-10	Resprouting (fire)	
1247	2018-09-02	*E. salmonophloia*	Nesting	Yes		750845	6406434	34	0-10	Resprouting (fire)	
1248	2018-09-02	*E. urna*	Nesting			751031	6406626	37	0-10	Resprouting (fire)	
1249	2018-09-02	*E. salmonophloia*	Nesting	Yes		750597	6406595	46	0-10	Resprouting (fire)	
1250	2018-09-02	*E. salmonophloia*	Nesting			756070	6392142	38	0-10	Resprouting (fire)	
1251	2018-09-02	*E. urna*	Nesting			751560	6406439	30	0-10	Resprouting (fire)	
1252	2018-09-02	*E. urna*	Nesting			751405	6406454	34	0-10	Resprouting (fire)	
1253	2018-09-02	*E. urna*	Nesting			751387	6406479	40	10-15	Resprouting (fire)	
1254	2018-09-02	*E. urna*	Nesting			751367	6406471	32	0-10	Resprouting (fire)	
1255	2018-09-02	*E. urna*	Nesting			751158	6406539	42	10-15	Resprouting (fire)	
1256	2018-09-02	*E. salmonophloia*	Nesting			750954	6406507	30	0-10	Resprouting (fire)	
1257	2018-09-02	*E. salmonophloia*	Nesting			750745	6406499	33	10-15	Resprouting (fire)	
1258	2018-09-02	*E. salmonophloia*	Nesting			750692	6406490	32	10-15	Resprouting (fire)	
1259	2018-09-02	*E. salmonophloia*	Nesting			750691	6406493	35	0-10	Resprouting (fire)	
1260	2018-09-02	*E. salmonophloia*	Nesting	Yes		750657	6406501	33	0-10	Resprouting (fire)	
1261	2018-09-02	*E. salmonophloia*	Nesting			750651	6406510	40	0-10	Resprouting (fire)	
1262	2018-09-02	*E. salmonophloia*	Nesting			750602	6406487	32	10-15	Resprouting (fire)	
1263	2018-09-02	*E. salmonophloia*	Nesting			750567	6406503	35	10-15	Resprouting (fire)	
1264	2018-09-02	*E. salmonophloia*	Nesting			750559	6406494	35	10-15	Resprouting (fire)	
1265	2018-09-02	*E. salmonophloia*	Nesting			750508	6406499	44	10-15	Resprouting (fire)	
1266	2018-09-02	*E. salmonophloia*	Nesting	Yes		750694	6406539	52	0-10	Resprouting (fire)	
1267	2018-09-02	*E. salmonophloia*	Nesting	Yes		750861	6406587	66	0-10	Resprouting (fire)	

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1268	2018-09-02	*E. salmonophloia*	Nesting	Yes		750871	6406577	55	0-10	Resprouting (fire)	
1269	2018-09-02	*E. salmonophloia*	Nesting	Yes		750930	6406596	50	10-15	Resprouting (fire)	
1270	2018-09-02	*E. salmonophloia*	Nesting			750985	6406564	43	10-15	Resprouting (fire)	
1271	2018-09-02	*E. urna*	Nesting			751110	6406592	41	10-15	Resprouting (fire)	
1272	2018-09-02	*E. urna*	Nesting			751107	6406577	31	10-15	Resprouting (fire)	
1273	2018-09-02	*E. urna*	Nesting			751114	6406569	39	10-15	Resprouting (fire)	
1274	2018-09-02	*E. urna*	Nesting			751201	6406583	34	10-15	Resprouting (fire)	
1275	2018-09-02	*E. urna*	Nesting	Yes		751247	6406581	42	10-15	Resprouting (fire)	
1276	2018-09-02	*E. urna*	Nesting			751258	6406571	49	10-15	Resprouting (fire)	
1277	2018-09-02	*E. urna*	Nesting			751286	6406563	41	0-10	Resprouting (fire)	
1278	2018-09-02	*E. urna*	Nesting			751362	6406517	32	0-10	Resprouting (fire)	
1279	2018-09-02	*E. urna*	Nesting	Yes		751259	6406596	37	0-10	Resprouting (fire)	
1280	2018-09-02	*E. urna*	Nesting			751193	6406638	34	0-10	Resprouting (fire)	
1281	2018-09-02	*E. urna*	Nesting	Yes		751080	6406638	64	10-15	Resprouting (fire)	
1282	2018-09-02	*E. urna*	Nesting			751139	6406669	41	10-15	Resprouting (fire)	
1283	2018-09-02	*E. urna*	Nesting	Yes		751073	6406628	31	0-10	Resprouting (fire)	
1284	2018-09-02	*E. urna*	Nesting			751058	6406620	40	0-10	Resprouting (fire)	
1285	2018-09-02	*E. urna*	Nesting			751056	6406615	39	10-15	Resprouting (fire)	
1286	2018-09-02	*E. urna*	Nesting			751053	6406615	31	0-10	Resprouting (fire)	
1287	2018-09-02	*E. urna*	Nesting			751034	6406614	32	0-10	Resprouting (fire)	
1288	2018-09-02	*E. salmonophloia*	Nesting	Yes		750825	6406638	70	10-15	Resprouting (fire)	
1289	2018-09-02	*E. salmonophloia*	Nesting			750621	6406599	52	0-10	Resprouting (fire)	
1290	2018-09-02	*E. salmonophloia*	Nesting			750576	6406585	43	10-15	Resprouting (fire)	
1291	2018-09-02	*E. salmonophloia*	Nesting	Yes		750586	6406658	58	0-10	Resprouting (fire)	
1292	2018-09-02	*E. salmonophloia*	Nesting	Yes		750739	6406668	50	0-10	Resprouting (fire)	
1293	2018-09-02	*E. salmonophloia*	Nesting			750741	6406673	36	0-10	Resprouting (fire)	
1294	2018-09-02	*E. salmonophloia*	Nesting	Yes		750876	6406683	58	15-20	Resprouting (fire)	
1295	2018-09-02	*E. salmonophloia*	Nesting	Yes		750881	6406654	31	0-10	Resprouting (fire)	
1296	2018-09-02	*E. salmonophloia*	Nesting	Yes		750882	6406653	42	0-10	Resprouting (fire)	
1297	2018-09-02	*E. salmonophloia*	Nesting	Yes		750961	6406595	58	0-10	Resprouting (fire)	
1298	2018-09-02	*E. salmonophloia*	Nesting			750598	6406579	46	0-10	Resprouting (fire)	
1299	2018-09-02	*E. salmonophloia*	Nesting	Yes		750644	6406689	54	10-15	Resprouting (fire)	
1300	2018-09-03	*E. salmonophloia*	Nesting	Yes		753716	6402939	42	0-10	Resprouting (fire)	
1301	2018-09-03	*E. salmonophloia*	Nesting	Yes		753721	6402938	44	0-10	Resprouting (fire)	
1302	2018-09-03	*E. salmonophloia*	Nesting	Yes		753727	6403076	67	10-15	Resprouting (fire)	
1303	2018-09-03	*E. salmonophloia*	Nesting	Yes		753740	6403096	70	10-15	Resprouting (fire)	
1304	2018-09-03	*E. urna*	Nesting	Yes		753732	6403321	45	0-10	Resprouting (fire)	
1305	2018-09-03	*E. urna*	Nesting			753732	6403353	47	10-15	Resprouting (fire)	
1306	2018-09-03	*E. urna*	Nesting	Yes		753709	6403599	54	10-15	Resprouting (fire)	
1307	2018-09-03	*E. urna*	Nesting	Yes		753723	6403701	40	0-10	Resprouting (fire)	
1308	2018-09-03	*E. urna*	Nesting	Yes		753741	6403911	55	0-10	Resprouting (fire)	
1309	2018-09-03	*E. urna*	Nesting	Yes		753729	6404033	41	0-10	Resprouting (fire)	
1310	2018-09-03	*E. salmonophloia*	Nesting			753713	6404303	39	0-10	Resprouting (fire)	
1311	2018-09-03	*E. salmonophloia*	Nesting			753696	6404364	37	0-10	Resprouting (fire)	
1312	2018-09-03	*E. salmonophloia*	Nesting			753690	6404362	39	10-15	Resprouting (fire)	
1313	2018-09-03	*E. salmonophloia*	Nesting			753694	6404362	35	0-10	Resprouting (fire)	
1314	2018-09-03	*E. urna*	Nesting	Yes		753736	6404619	50	0-10	Resprouting (fire)	
1315	2018-09-03	*E. salmonophloia*	Nesting	Yes		753702	6404630	40	0-10	Resprouting (fire)	
1316	2018-09-03	*E. salmonophloia*	Nesting			753694	6405274	45	0-10	Resprouting (fire)	
1317	2018-09-03	*E. salmonophloia*	Nesting	Yes		753700	6405303	39	0-10	Resprouting (fire)	
1318	2018-09-03	*E. transcontinentalis*	Nesting			752855	6407693	30	0-10	Resprouting (fire)	
1319	2018-09-03	*E. transcontinentalis*	Nesting	Yes		752845	6407707	45	0-10	Resprouting (fire)	
1320	2018-09-03	*E. transcontinentalis*	Nesting	Yes		752833	6407709	40	0-10	Resprouting (fire)	
1321	2018-09-03	*E. transcontinentalis*	Nesting	Yes		752833	6407719	45	10-15	Resprouting (fire)	
1322	2018-09-03	*E. transcontinentalis*	Nesting			752840	6407732	30	0-10	Resprouting (fire)	
1323	2018-09-03	*E. transcontinentalis*	Nesting			752847	6407733	32	0-10	Resprouting (fire)	
1324	2018-09-03	*E. transcontinentalis*	Nesting	Yes		752858	6407728	40	0-10	Resprouting (fire)	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
1325	2018-09-03	*E. transcontinentalis*	Nesting			752898	6407671	40	0-10	Resprouting (fire)	
1326	2018-09-03	*E. salmonophloia*	Nesting	Yes		753712	6405271	46	0-10	Resprouting (fire)	
1327	2018-09-03	*E. salmonophloia*	Nesting			753715	6405157	31	0-10	Resprouting (fire)	
1328	2018-09-03	*E. salmonophloia*	Nesting	Yes	Yes	753722	6404613	37	0-10	Resprouting (fire)	
1329	2018-09-03	*E. salmonophloia*	Nesting			753726	6404597	43	0-10	Resprouting (fire)	
1330	2018-09-03	Indet. Stag	Nesting	Yes		753742	6404591	40	0-10	Resprouting (fire)	
1331	2018-09-03	Indet. Stag	Nesting	Yes		753755	6404318	57	0-10	Resprouting (fire)	
1332	2018-09-03	*E. salmonophloia*	Nesting			753728	6404304	41	0-10	Resprouting (fire)	
1333	2018-09-03	*E. urna*	Nesting	Yes		753732	6403903	57	0-10	Resprouting (fire)	
1334	2018-09-03	*E. urna*	Nesting	Yes		753760	6403905	34	0-10	Resprouting (fire)	
1338	2018-09-03	*E. salmonophloia*	Nesting	Yes		753749	6402924	41	0-10	Resprouting (fire)	
1339	2018-09-03	*E. urna*	Nesting	Yes		753672	6405518	40	0-10	Resprouting (fire)	
1340	2018-09-03	*E. urna*	Nesting	Yes		753670	6405516	52	0-10	Resprouting (fire)	
1341	2018-09-03	*E. urna*	Nesting	Yes		753694	6404005	40	0-10	Resprouting (fire)	
1342	2018-09-03	*E. urna*	Nesting			751597	6405206	43	0-10	Resprouting (fire)	
1343	2018-09-03	*E. salmonophloia*	Nesting			751408	6405222	37	10-15	Resprouting (fire)	
1344	2018-09-03	*E. salmonophloia*	Nesting			751398	6405231	33	0-10	Resprouting (fire)	
1345	2018-09-03	*E. urna*	Nesting			751546	6405248	47	0-10	Resprouting (fire)	
1346	2018-09-03	*E. salmonophloia*	Nesting			751433	6405368	38	0-10	Resprouting (fire)	
1347	2018-09-03	*E. urna*	Nesting	Yes		751574	6405421	46	10-15	Resprouting (fire)	
1348	2018-09-03	*E. urna*	Nesting			751533	6405416	37	10-15	Resprouting (fire)	
1349	2018-09-03	*E. salmonophloia*	Nesting			751508	6405428	37	0-10	Resprouting (fire)	
1350	2018-09-03	*E. urna*	Nesting			751343	6405446	39	0-10	Resprouting (fire)	
1351	2018-09-03	*E. urna*	Nesting	Yes		751620	6405196	58	0-10	Resprouting (fire)	
1352	2018-09-03	*E. urna*	Nesting			751609	6405193	30	0-10	Resprouting (fire)	
1353	2018-09-03	*E. urna*	Nesting	Yes		751550	6405206	40	10-15	Resprouting (fire)	
1354	2018-09-03	*E. salmonophloia*	Nesting			751450	6405226	40	10-15	Resprouting (fire)	
1355	2018-09-03	*E. salmonophloia*	Nesting			751436	6405219	38	10-15	Resprouting (fire)	
1356	2018-09-03	*E. salmonophloia*	Nesting			751213	6405219	30	10-15	Resprouting (fire)	
1357	2018-09-03	*E. salmonophloia*	Nesting			751413	6405265	30	0-10	Resprouting (fire)	
1358	2018-09-03	*E. urna*	Nesting	Yes		751566	6405264	70	10-15	Resprouting (fire)	
1359	2018-09-03	*E. urna*	Nesting	Yes		751516	6405334	42	0-10	Resprouting (fire)	
1360	2018-09-03	*E. salmonophloia*	Nesting			751456	6405331	30	0-10	Resprouting (fire)	
1361	2018-09-03	*E. salmonophloia*	Nesting			751408	6405331	31	0-10	Resprouting (fire)	
1362	2018-09-03	*E. salmonophloia*	Nesting			751363	6405314	34	10-15	Resprouting (fire)	
1363	2018-09-03	*E. urna*	Nesting			751139	6405387	30	0-10	Resprouting (fire)	
1364	2018-09-03	*E. urna*	Nesting	Yes		751618	6405408	45	0-10	Resprouting (fire)	
1365	2018-09-03	*E. urna*	Nesting	Yes		751609	6405407	43	0-10	Resprouting (fire)	
1366	2018-09-03	*E. urna*	Nesting	Yes		751549	6405413	39	0-10	Resprouting (fire)	
1367	2018-09-03	*E. salmonophloia*	Nesting	Yes		751522	6405414	42	0-10	Resprouting (fire)	
1368	2018-09-03	*E. salmonophloia*	Nesting			751500	6405425	31	0-10	Resprouting (fire)	
1369	2018-09-03	*E. urna*	Nesting			751578	6405479	46	0-10	Resprouting (fire)	
1370	2018-09-04	*E. urna*	Nesting			751482	6405565	37	0-10	Resprouting (fire)	
1371	2018-09-04	*E. urna*	Nesting			751461	6405574	36	10-15	Resprouting (fire)	
1372	2018-09-04	*E. urna*	Nesting			751348	6405577	43	0-10	Resprouting (fire)	
1373	2018-09-04	*E. urna*	Nesting			751533	6405510	32	0-10	Resprouting (fire)	
1374	2018-09-04	*E. urna*	Nesting			751521	6405513	35	0-10	Resprouting (fire)	
1375	2018-09-04	*E. urna*	Nesting			751472	6405505	34	0-10	Resprouting (fire)	
1376	2018-09-04	*E. urna*	Nesting			751422	6405520	35	0-10	Resprouting (fire)	
1377	2018-09-04	*E. urna*	Nesting			751398	6405500	40	0-10	Resprouting (fire)	
1378	2018-09-04	*E. urna*	Nesting			751354	6405494	45	10-15	Resprouting (fire)	
1379	2018-09-04	*E. urna*	Nesting			751235	6405490	30	0-10	Resprouting (fire)	
1380	2018-09-04	*E. urna*	Nesting			751164	6405495	31	10-15	Resprouting (fire)	
1381	2018-09-04	*E. urna*	Nesting			751156	6405493	32	10-15	Resprouting (fire)	
1382	2018-09-04	*E. urna*	Nesting			750960	6405568	30	10-15	Resprouting (fire)	
1383	2018-09-04	*E. urna*	Nesting			751087	6405551	31	10-15	Resprouting (fire)	
1384	2018-09-04	*E. urna*	Nesting			751156	6405531	32	10-15	Resprouting (fire)	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
1385	2018-09-04	*E. urna*	Nesting			751327	6405535	33	0-10	Resprouting (fire)	
1386	2018-09-04	*E. urna*	Nesting	Yes		751497	6405557	32	0-10	Resprouting (fire)	
1387	2018-09-04	*E. urna*	Nesting			751217	6405560	37	0-10	Resprouting (fire)	
1388	2018-09-04	*E. urna*	Nesting	Yes		751538	6405528	35	10-15	Resprouting (fire)	
1389	2018-09-04	*E. urna*	Nesting			751348	6405528	50	0-10	Resprouting (fire)	
1390	2018-09-04	*E. urna*	Nesting			751292	6405527	31	0-10	Resprouting (fire)	
1391	2018-09-04	*E. urna*	Nesting			751370	6405557	41	10-15	Resprouting (fire)	
1392	2018-09-04	*E. urna*	Nesting			751523	6405549	37	0-10	Resprouting (fire)	
1393	2018-09-04	*E. urna*	Nesting			751223	6405564	31	0-10	Resprouting (fire)	
1394	2018-09-04	*E. urna*	Nesting			751208	6405560	31	0-10	Resprouting (fire)	
1395	2018-09-04	*E. salmonophloia*	Nesting	Yes		750913	6405635	55	0-10	Resprouting (fire)	
1396	2018-09-04	E. salmonophloia	Nesting	Yes		750846	6405635	61	10-15	Resprouting (fire)	
1397	2018-09-04	*E. urna*	Nesting			751195	6405672	59	15-20	Resprouting (fire)	
1398	2018-09-04	*E. urna*	Nesting	Yes		751475	6405670	57	10-15	Resprouting (fire)	
1399	2018-09-05	*E. urna*	Nesting	Yes		750549	6406767	38	10-15	Resprouting (fire)	
1400	2018-09-05	*E. transcontinentalis*	Nesting			751018	6406731	35	0-10	Resprouting (fire)	
1401	2018-09-05	*E. transcontinentalis*	Nesting			750998	6406818	37	0-10	Resprouting (fire)	
1402	2018-09-05	*E. longicornis*	Nesting			752679	6403116	38	0-10	Resprouting (fire)	
1403	2018-09-05	*E. longicornis*	Nesting			752680	6403116	35	0-10	Resprouting (fire)	
1404	2018-09-05	*E. urna*	Nesting			752755	6403069	40	0-10	Resprouting (fire)	
1405	2018-08-29	*E. urna*	Nesting	Yes		751676	6405567	81	10-15	Stressed	
1406	2018-08-30	*E. salmonophloia*	Nesting	Yes		751542	6404474	100	10-15	Stressed	
1407	2018-08-30	*E. salmonophloia*	Nesting			751319	6404529	38	0-10	Stressed	
1408	2018-08-30	*E. salmonophloia*	Nesting			751282	6404682	43	0-10	Stressed	
1409	2018-08-30	*E. salmonophloia*	Nesting			751418	6404474	33	0-10	Stressed	
1410	2018-08-30	*E. salmonophloia*	Nesting			751556	6404601	49	10-15	Stressed	
1411	2018-08-30	*E. salmonophloia*	Nesting			751368	6404584	40	0-10	Stressed	
1412	2018-08-30	*E. salmonophloia*	Nesting			751359	6404575	48	10-15	Stressed	
1413	2018-08-31	*E. salmonophloia*	Nesting			750705	6405952	59	0-10	Stressed	
1414	2018-08-31	*E. salmonophloia*	Nesting			750989	6405978	39	0-10	Stressed	
1415	2018-08-31	*E. salmonophloia*	Nesting			750823	6405826	31	0-10	Stressed	
1416	2018-08-31	*E. urna*	Nesting			751627	6405803	46	0-10	Stressed	
1417	2018-08-31	*E. salmonophloia*	Nesting			750914	6405663	34	0-10	Stressed	
1418	2018-08-31	*E. urna*	Nesting			751046	6405986	32	0-10	Stressed	
1419	2018-08-31	*E. urna*	Nesting	Yes		751626	6405935	38	0-10	Stressed	
1420	2018-08-31	*E. urna*	Nesting	Yes		751542	6405918	57	0-10	Stressed	
1421	2018-08-31	*E. urna*	Nesting			751159	6405929	43	0-10	Stressed	
1422	2018-08-31	*E. salmonophloia*	Nesting			750760	6405879	34	0-10	Stressed	
1423	2018-08-31	*E. salmonophloia*	Nesting			750851	6405792	39	0-10	Stressed	
1424	2018-08-31	*E. salmonophloia*	Nesting			750943	6405771	33	0-10	Stressed	
1426	2018-08-31	*E. urna*	Nesting			751538	6404717	71	10-15	Stressed	
1427	2018-08-31	*E. salmonophloia*	Nesting			751492	6404897	48	10-15	Stressed	
1428	2018-09-01	*E. urna*	Nesting			751075	6406132	33	0-10	Stressed	
1429	2018-09-01	*E. urna*	Nesting			751567	6406036	37	0-10	Stressed	
1430	2018-09-01	*E. urna*	Nesting			751118	6406011	38	0-10	Stressed	
1431	2018-09-01	*E. urna*	Nesting			751017	6406227	46	0-10	Stressed	
1432	2018-09-01	*E. salmonophloia*	Nesting			750577	6406251	42	0-10	Stressed	
1433	2018-09-01	*E. urna*	Nesting			751326	6406330	37	10-15	Stressed	
1434	2018-09-01	*E. salmonophloia*	Nesting			750537	6406334	38	0-10	Stressed	
1435	2018-09-01	*E. urna*	Nesting			751078	6406317	35	0-10	Stressed	
1436	2018-09-01	*E. urna*	Nesting			751336	6406341	35	0-10	Stressed	
1437	2018-09-02	*E. urna*	Nesting			751581	6405027	32	10-15	Stressed	
1438	2018-09-02	*E. salmonophloia*	Nesting			751339	6405088	33	0-10	Stressed	
1439	2018-09-02	*E. salmonophloia*	Nesting			751379	6405098	30	0-10	Stressed	
1440	2018-09-02	*E. salmonophloia*	Nesting			751431	6405177	34	10-15	Stressed	
1441	2018-09-02	*E. urna*	Nesting			751593	6405171	58	10-15	Stressed	
1442	2018-09-02	*E. urna*	Nesting			751091	6406567	42	0-10	Stressed	

Tree ID	Date	Tree Species	Habitat Tree Type	Potential Nesting Hollows (current survey)	Potential Nesting Hollows (Johnstone and Kirkby 2019)	Easting (mE)	Northing (mN)	DBH (cm)	Tree Height (m)	Tree Health	Signs of Use
1443	2018-09-02	*E. urna*	Nesting			751178	6406578	41	10-15	Stressed	
1444	2018-09-02	*E. urna*	Nesting	Yes		751261	6406602	37	0-10	Stressed	
1445	2018-09-02	*E. transcontinentalis*	Nesting			751168	6406667	70	0-10	Stressed	
1446	2018-09-02	*E. salmonophloia*	Nesting			750869	6406676	41	10-15	Stressed	
1447	2018-09-02	*E. urna*	Nesting			751263	6406582	31	0-10	Stressed	
1448	2018-09-02	*E. urna*	Nesting			751033	6406610	35	10-15	Stressed	
1449	2018-09-03	*E. transcontinentalis*	Nesting			752790	6407730	34	10-15	Stressed	
1450	2018-09-03	*E. transcontinentalis*	Nesting			752859	6407612	38	0-10	Stressed	
1451	2018-09-03	*E. transcontinentalis*	Nesting			752886	6407603	38	10-15	Stressed	
1452	2018-09-03	*E. urna*	Nesting			753662	6405475	41	0-10	Stressed	
1453	2018-09-03	*E. urna*	Nesting			753687	6404125	32	10-15	Stressed	
1454	2018-09-03	*E. urna*	Nesting			753687	6404116	41	10-15	Stressed	
1455	2018-09-03	*E. urna*	Nesting			751632	6405292	46	10-15	Stressed	
1456	2018-09-03	*E. urna*	Nesting			751593	6405489	52	0-10	Stressed	
1457	2018-09-05	*E. transcontinentalis*	Nesting			751002	6406730	33	10-15	Stressed	
1458	2018-08-31	*E. urna*	Nesting	Yes		751614	6405816	73	10-15	Alive	Scarring
1459	2018-08-30	*E. salmonophloia*	Nesting			751630	6404546	55	10-15	Alive	Scarring, scratch marks
1460	2018-08-30	*E. salmonophloia*	Nesting			751744	6406540	32	0-10	Stressed	Scratch marks
1461	2018-08-31	*E. salmonophloia*	Nesting			750999	6405973	35	10-15	Alive	Scratch marks, chewing

Appendix 5

Helix Molecular Solutions Potential SRE Mygalomorph Spider Sequencing Report

Helix
Molecular
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6 November 2018

Dan Kamien
Biota Environmental Sciences
Level 1 / 228 Carr Place
Leederville WA 6007

Via email

Re. Report on the molecular systematics of the New Morning mygalomorph specimens from Forrestania.

Dear Dan,

Following is a summary of the results of the invertebrate molecular investigation we have completed for the New Morning Forrestania Fauna survey. Results suggest that amongst the nine successfully sequenced mygalomorph spider specimens, one belongs to a distinct, previously unrecorded species of *Missulena* (family Actinopodidae), there were three lineages amongst seven specimens of Idiopidae, one individual of which was an *Aganippe* sp. and the remaining six individuals belonged to an *Idiosoma* species that has been recorded and sequenced previously at Forrestania. There was also a single *Chenistonia* (family Nemesiidae) specimen sequenced that has previously been recorded and sequenced from Forrestania. We were unable to obtain a good quality sequence from three specimens, and therefore the placement of these suspected idiopid specimens remains unresolved.

Thanks once again for collaborating on this project with Helix. We hope we can continue to provide you with useful information, and feel free to contact us if you have any questions or would like to discuss the results in detail.

Sincerely,

Dr. Zoë Hamilton, Dr. Terrie Finston and Yvette Hitchen
Helix Molecular Solutions

Background and Objective

The infraorder of Arachnida, Mygalmomorphae, includes trapdoor spiders and their kin, and they are frequently identified as short-range endemics (SREs)(e.g. Harvey *et al*., 2011; Castalanelli *et al*., 2014). Identification of species has traditionally been performed using morphological techniques, however, only males can be used in identification, as both females and juveniles lack the diagnostic characters used in identification, and furthermore there is a large backlog of undescribed taxa. DNA barcoding with the use of *COI* mtDNA has become a rapid, objective method aiding mygalomorph species identifications and their distributions, and is recognised as providing important information that regulatory authorities can use to assess environmental impacts of large-scale developments (Harvey *et al*., 2008; Environmental Protection Authority, 2009; Castalanelli *et al*., 2014). Extensive molecular work has been conducted on the trap-door spider fauna of Western Australia (Helix, 2009a &b, 2010, 2011a - k, 2012a - h, 2013a & b, 2014a - d, 2015a - e). The resulting dataset provides a molecular framework that can be used to provide regional context for localised sampling.

Twelve specimens of invertebrate fauna belonging to three families of mygalomorph spiders (Araneae: Mygalomorphae: Nemesiidae, Idiopidae & Actinopodidae) from the New Morning Fauna Survey area that occurs predominantly in the Coolgardie bioregion (Southern Cross subregion), and partially in the Mallee bioregion (Western Mallee subregion) were sequenced for variation at the mitochondrial cytochrome oxidase subunit I gene (*COI*). The nine successful resulting molecular sequences were then assessed to determine the number of taxa present and compare these results to those sequences publically available on GenBank and those already in Helix's database for context.

Executive summary

- Twelve specimens of mygalomorph spiders belonging from the survey area were sequenced and assessed for variation at the *COI* mtDNA gene. The molecular data were then placed within an existing molecular taxonomic framework for each family, using *COI* mtDNA sequences from GenBank as well as all mygalomorph *COI* sequences in the Helix database.
- Three families (Actinopodidae, Idiopidae & Nemesiidae) were amongst the nine successfully sequenced specimens. Five haplotypes were amongst the nine successfully sequenced individuals, with one idiopid haplotype shared amongst five individuals.
- Analyses place the actinopodid specimen within the *Missulena* clade, this specimen has not been recorded previously and is likely to represent a new species, based on molecular data.
- The idiopid specimens belonged to two genera (*Aganippe* & *Idiosomma*), with the *Idiosomma* specimens showing affinity to previously collected species from the vicinity. The *Aganippe* specimen represents a new species based on the molecular data.
- Analyses place the nemesiid specimen in the *Chenistonia* clade, along with a species previously recorded from the area.

Methods

Twelve mygalomorph spider specimens from twelve sampling locations (Table 1) were sequenced for variation at the cytochrome oxidase subunit I gene (*COI*) using primers LCOI & HCO2 (Folmer *et al*., 1994). Three of these sequences were unable to be analysed, due to the sequence quality. The resulting nine mygalomoprh sequences comprised five haplotypes (table 2).

The sequences from the nine successfully sequenced individuals were edited using SEQUENCHER software (Gene Codes Corporation, Ann Arbor, MI, USA). Alignment was performed with CLUSTAL W (Thompson *et al*., 1994) using default parameters. DNA nucleotide sequences were translated into protein sequences to ensure that the amplified sequences corresponded to the target mtDNA. The translated protein sequences were then checked for the presence of stop codons. All sequences sequences were 'BLAST'ed (Basic Local Alignment Search Tool) with the NCBI (National Centre for Biotechnology Information). This program compares DNA nucleotide sequences with a library of sequences and identifies sequences within the database that resemble the query sequences above a certain threshold. Genetic distances between unique genetic sequences (haplotypes) were measured using uncorrected

p-distances (total percentage of nucleotides different between sequences). To account for polymorphism within lineages, the net genetic diversity of Nei (1987) was calculated to give a 'corrected' distance between lineages.

For phylogenetic analysis, likelihood ratio tests using the Bayesian Information Criterion were calculated in MEGA 6.06 (Tamura *et al*., 2013) to determine the best-fit model of evolution. The phylogenetic analyses were calculated in MEGA 6.06 (Tamura *et al*., 2013) using maximum likelihood (ML) with 1000 bootstrap replicates, based on the genetic distances with the best-fit model of evolution calculated for each family. For the Actinopodidae family, the best model of evolution was Tamura-Nei with Gamma distribution (TN93 + G), the parameter for the gamma distribution was 0.41. For the Idiopidae, the General Time Reversible with gamma distribution and invariant sites (GTR + G + I) was the best model of evolution with a gamma distribution of 0.61. The Nemesiidae also had the GTR + G + I as the best model of evolution but with a gamma distribution of 0.76. The phylogenetic analysis performed separately for each mygalomorph family, and included the representative haplotypes for the New Morning specimens from the survey area, as well as a total of one hundred and sixty-eight reference specimens (Actinopodidae n=24, Idiopidae n=137, Nemesiidae n=7) all within 15 % sequence divergence of the New Morning specimens, obtained both from Helix's database and from GenBank (Appendix 1).

Results and Conclusions

The mtDNA gene cytochrome oxidase 1 (*COI*) is widely considered to show suitable variation to distinguish species (Hebert *et al*., 2003a), and the use of this gene can be extremely effective for 'DNA barcoding' in taxa where clear differentiation exists between intra and interspecific levels of divergence (e.g. Hebert *et al*., 2004a; 2004b). Despite its merits in barcoding however, a taxon by taxon approach, examining the amount of phylogenetic variation within and between taxa is the most widely accepted method of delineating species and their distributions, especially in areas where rapidly expanding mining operations outpace taxonomic treatment of unresolved taxa. Specifically, a broadscale survey of Mygalomorphae in the Pilbara (Castanelli *et al*., 2014) along with additional samples form the Helix database, indicate that intraspecific variation within morphologically recognised species ranges from 1.3 % to 7.3 % (see Appendix 2) and variation between species ranged from 8.0 % to 14.8 % within the genus *Idiosoma* (see Appendix 3).

Phylogenetic Analyses

A 686 base-pair (bp) fragment of *COI* was isolated for nine of the twelve specimens. Because multiple specimens shared identical DNA sequences (haplotypes), the data set was reduced to include only distinct haplotypes. Of the nine specimens, four had distinct haplotypes.

Actinopodidae

The phylogenetic analysis for the single actinopodid specimen, along with the twenty-four additional reference sequences (all included sequences showed ≤15 % sequence divergence) revealed the New Morning specimen (NX01) to sit within the clade containing reference sequences belonging to the genus *Missulena* (see Figure 1). The results found that the New Morning specimen did not show a close affinity to any of the previously sequenced specimens from Helix's database, or from GenBank and therefore represents a newly recorded species, '*Missulena* sp. AYA16' (see Table 1) based on the molecular data. The closest relative, based on genetic distance (Table 3), and its phylogenetic placement (Figure 1), was a *Missulena* specimen (AAD A13 FE31) previously collected from Kundip 148 km south of the New Morning *Missulena* specimen (NX01, *Missulena* sp. AYA16'). The same species (A13) has also been recorded from Exclamation Lake 168 km to the East of the New Morning *Missulena* that and showed 13.1 % sequence divergence (AAD A13 0139) (see table 3).

Idiopidae

Amongst the seven idiopid mygalomorph specimens, three haplotypes existed, with one haplotype shared amongst five individuals (NX04, NX05, NX06, NX08 & NX10). One individual (NX04) was chosen to represent this haplotype in the phylogenetic analyses. The phylogenetic analysis for the three haplotypes of Idiopidae along with the 137 reference sequences (≤15 %

sequence divergence) obtained from the Helix molecular database and the GenBank database, revealed that two haplotypes (NX04 & NX07), representing six specimens, belonged to a species of *Idiosomma* previously collected and sequenced from Forrestania ('*Idiosomma* sp. IA I121', see table 1) within 13 km to the south, although it was previously referred to as an '*Aganippe*' due to the reference data available at that time (Helix, 2010) (see figure 2). Sequence divergence within this species shows variation of less than 1 % (Table 4). Analyses revealed the other idiopid specimen (NX02) to be an *Aganippe*, but not a strongly supported clade (Figure 2). The long-branch length of this specimen, depicted in the phylogenetic tree (Figure 2), suggests this specimen is likely to represent a newly record *Aganippe* species ('*Aganippe* sp. ICV I67', Table 1) with sequences divergences exceeding those of the species boundary cut-off/threshold proposed for mygales (9.5% in Castalanelli *et al*., 2014) (11.7 % with IBA I36 O21 & 12.6 % to FE20 IES I76) (see table 5), and interspecific divergences observed in described species (Appendix 3).

Nemesiidae

The phylogenetic analysis for the single nemesiid single specimen (NX12) placed the specimen within the *Chenistonia* genus clade and along with the '*Chenistonia* sp. NCF N68' (Figure 3) sequenced from a previous Forrestania survey 13 km to the south (Helix, 2010). Sequence divergences within the species clade was less than 4 % (Table 6), well within the range of expected intraspecific divergences (see Appendix 2).

Summary

Based on phylogenetic placement and genetic distance analyses, four species were detected among the nine specimens for which sequences were successfully obtained.

Actinopodidae (n=1)

- Lineage AYA, species I6 in the genus *Missulena* – newly sequenced species –no previous records.

Idiopidae (n=7)

- Lineage ICV, species I67 in the genus *Aganippe* (n=1) – newly sequenced species – no previous records.
- Lineage IA, species I121 in the genus *Idiosoma* (n=6)– previously detected at Forrestania.

Nemesiidae (n=1)

- Lineage NCF, species N68 in the genus *Chenistonia* – previously detected at Forrestania

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Table 1. Mygalomorph spider specimens used in the present study, and the genetic lineage to which they belong.

Biota Specimen ID	Helix Lab ID	*Family*	Genetic Lineage/ Taxonomic ID
M20180905NMSRE11-01	NX01	Actinopodidae	New species '*Missulena* sp. AYA 16'
M20180828NMSRE01-01	NX02	Idiopidae	New species '*Aganippe* sp. ICV I67'
M20180829NMSRE02-01	NX03	Idiopidae	Unusable sequence
M20180831NMM06-01	NX04	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M20180902.NMSRE03-02	NX05	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M20180904NMSRE05-01	NX06	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M20180904NMSRE05-03	NX07	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M20180904NMM06-03	NX08	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M201809NMSRE07-01	NX09	Idiopidae	Unusable sequence
M20180904NMSRE07-02	NX10	Idiopidae	Previously recorded species – '*Idiosomma* sp. IA I121'
M20180905NMSRE09-01	NX11	Idiopidae	Unusable sequence
M20180904NMM06-02	NX12	Nemesiidae	Previously recorded species- '*Chenistonia* sp. NCF N68'

Table 2. Genetic p-distance (below) and the associated standard error (above – blue text) between the five mygalomorph haplotypes belonging to the nine individuals, from three families (Actinopodidae, Idiopidae, Nemesiidae) sequenced from the New Morning area as shown in Figure 1. Specimens identified with '*' are those representing shared haplotypes. Un-corrected p-distances do not account for mutational saturation, which results from back mutations, and therefore provide a conservative estimate of genetic distance.

	NX01	NX02	NX04*	NX07	NX12
NX01		0.015	0.015	0.015	0.016
NX02	0.191		0.014	0.014	0.016
NX04*	0.190	0.156		0.002	0.016
NX07	0.189	0.156	0.003		0.016
NX12	0.206	0.239	0.221	0.221	

Table 3. Genetic p-distance (below) and the associated standard error (above – blue text) between all *Missulena* mygalomorph (Actinopodidae) haplotypes shown in Figure 1. New Morning *Missulena* specimen, and associated genetic distances, shaded in green, as per colour-coding in Figure 1. Un-corrected p-distances do not account for mutational saturation, which results from back mutations, and therefore provide a conservative estimate of genetic distance.

	NX01	AK A13 O139	AAD A13 FE31	AN A9 O141	AI A1 AF79	AO A7 O142	AA A1 AG24	AD A1 AT37	AT A1 BV029	AX A15 CZ43	KC708088.1 WAM T91631I	KC708080.1 WAM T113660	KC708079.1 WAM T113626	KY017544.1 MY2086 ARAMY00208 6	KC708086.1 WAM T96442	KJ745346.1 MYG048 voucher T91631
NX01		0.017	0.017	0.017	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.019	0.018
AK A13 O139	0.131		0.014	0.017	0.018	0.018	0.017	0.017	0.017	0.018	0.017	0.018	0.017	0.018	0.019	0.017
AAD A13 FE31	0.126	0.090		0.017	0.018	0.018	0.018	0.018	0.018	0.018	0.017	0.018	0.018	0.019	0.018	0.017
AN A9 O141	0.131	0.128	0.138		0.018	0.017	0.017	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.019	0.018
AI A1 AF79	0.151	0.151	0.158	0.146		0.018	0.013	0.012	0.011	0.018	0.018	0.013	0.013	0.018	0.018	0.018
AO A7 O142	0.151	0.158	0.143	0.126	0.156		0.018	0.018	0.018	0.019	0.018	0.018	0.018	0.019	0.019	0.018
AA A1 AG24	0.151	0.128	0.146	0.141	0.075	0.156		0.011	0.011	0.017	0.018	0.011	0.011	0.017	0.018	0.018
AD A1 AT37	0.148	0.131	0.146	0.153	0.065	0.148	0.053		0.010	0.017	0.018	0.011	0.010	0.018	0.018	0.018
AT A1 BV029	0.143	0.133	0.148	0.143	0.055	0.148	0.050	0.040		0.017	0.017	0.010	0.010	0.018	0.018	0.017
AX A15 CZ43	0.151	0.143	0.156	0.161	0.148	0.163	0.141	0.131	0.136		0.018	0.018	0.018	0.018	0.017	0.018
KC708088.1 WAM T91631I	0.153	0.136	0.133	0.151	0.148	0.158	0.143	0.148	0.133	0.143		0.017	0.017	0.018	0.018	0.000
KC708080.1 WAM T113660	0.146	0.143	0.146	0.143	0.073	0.143	0.053	0.048	0.045	0.148	0.138		0.003	0.018	0.018	0.017
KC708079.1 WAM T113626	0.146	0.141	0.143	0.143	0.075	0.143	0.050	0.045	0.043	0.148	0.138	0.003		0.018	0.018	0.017
KY017544.1 MY2086 ARAMY002086	0.158	0.161	0.168	0.153	0.158	0.178	0.141	0.156	0.156	0.156	0.151	0.153	0.153		0.019	0.018
KC708086.1 WAM T96442	0.168	0.168	0.153	0.166	0.161	0.173	0.151	0.151	0.156	0.126	0.161	0.156	0.153	0.168		0.018
KJ745346.1 MYG048 voucher T91631	0.153	0.136	0.133	0.151	0.148	0.158	0.143	0.148	0.133	0.143	0.000	0.138	0.138	0.151	0.161	

Table 4. Genetic p-distance (below) and the associated standard error (above – blue text) between all *Aganippe* mygalomorph (Idiopidae) haplotypes shown in Figure 2. New Morning *Aganippe* specimen, and associated genetic distances, shaded in blue, as per colour-coding in Figure 2. Un-corrected p-distances do not account for mutational saturation, which results from back mutations, and therefore provide a conservative estimate of genetic distance.

	KJ744570.1 Aganippe sp. MYG306 T103905	KJ744728.1 Aganippe sp. MYG224 T110218	KJ744729.1 Aganippe sp. MYG222 T110277	KJ744730.1 Aganippe sp. MYG221 T110278	NX02	FE20 IEA 176	FE47 IDZ 175	IAK 132 18	IAX 134 T96671	IBA 136 O21	KY295228.1 Aganippe sp. WAM T129362	KY295246.1 Aganippe sp. WAM T110224	KY295271.1 Aganippe sp. WAM T134180	KY295307.1 Aganippe sp. WAM T107160	KY295327.1 Aganippe sp. WAM T132757	KY295328.1 Aganippe sp. WAM T132738	KY295333.1 Aganippe sp. SAM-SH52	KY295337.1 Aganippe cupulifex WAM-T133995	KY295349.1 Aganippe sp. WAM T129259
KJ744570.1 Aganippe sp. MYG306 T103905		0.019	0.019	0.017	0.018	0.018	0.019	0.019	0.018	0.018	0.017	0.019	0.019	0.019	0.018	0.019	0.018	0.019	0.018
KJ744728.1 Aganippe sp. MYG224 T110218	0.168		0.017	0.018	0.017	0.019	0.018	0.017	0.017	0.018	0.017	0.000	0.019	0.018	0.019	0.017	0.018	0.017	0.017
KJ744729.1 Aganippe sp. MYG222 T110277	0.163	0.136		0.017	0.016	0.018	0.017	0.017	0.017	0.017	0.015	0.017	0.018	0.016	0.017	0.009	0.017	0.016	0.016
KJ744730.1 Aganippe sp. MYG221 T110278	0.138	0.151	0.141		0.017	0.018	0.018	0.018	0.018	0.018	0.016	0.018	0.019	0.018	0.012	0.017	0.018	0.018	0.019
NX02	0.143	0.128	0.116	0.136		0.017	0.017	0.017	0.017	0.016	0.017	0.017	0.018	0.018	0.017	0.016	0.018	0.016	0.018
FE20 IEA 176	0.158	0.166	0.161	0.158	0.126		0.018	0.018	0.018	0.015	0.016	0.019	0.017	0.018	0.019	0.019	0.019	0.017	0.019
FE47 IDZ 175	0.173	0.143	0.126	0.156	0.138	0.148		0.017	0.017	0.017	0.016	0.018	0.017	0.017	0.018	0.017	0.017	0.017	0.018
IAK 132 18	0.176	0.136	0.136	0.156	0.141	0.153	0.141		0.014	0.018	0.016	0.017	0.018	0.018	0.018	0.017	0.019	0.018	0.018
IAX 134 T96671	0.151	0.131	0.128	0.143	0.126	0.153	0.128	0.080		0.017	0.016	0.017	0.018	0.017	0.018	0.017	0.018	0.017	0.018
IBA 136 O21	0.161	0.148	0.126	0.156	0.118	0.101	0.128	0.156	0.133		0.016	0.018	0.014	0.018	0.018	0.017	0.019	0.016	0.018

	KJ744570.1 Agonippe sp. MYG306 T103905	KJ744728.1 Agonippe sp. MYG224 T110218	KJ744729.1 Agonippe sp. MYG222 T110277	KJ744730.1 Agonippe sp. MYG221 T110278	NX02	FE20 IEA I76	F647 IDZ I75	IAK I32 I8	IAX I34 T96671	IBA I36 O21	KY295228.1 Agonippe sp. WAM T129362	KY295246.1 Agonippe sp. WAM T110224	KY295271.1 Agonippe sp. WAM T134180	KY295307.1 Agonippe sp. WAM T109160	KY295327.1 Agonippe sp. WAM T132757	KY295328.1 Agonippe sp. WAM T132738	KY295333.1 Agonippe sp. SAM-SH52	KY295337.1 Agonippe cupulifex WAM-T133995	KY295349.1 Agonippe sp. WAM T129259
KY295228.1 Agonippe sp. WAM T129362	0.131	0.128	0.093	0.116	0.133	0.123	0.121	0.121	0.118	0.123		0.017	0.017	0.017	0.016	0.015	0.016	0.015	0.017
KY295246.1 Agonippe sp. WAM T110224	0.168	0.000	0.136	0.151	0.128	0.166	0.143	0.136	0.131	0.148	0.128		0.019	0.018	0.019	0.017	0.018	0.017	0.017
KY295271.1 Agonippe sp. WAM T134180	0.181	0.163	0.148	0.166	0.146	0.126	0.141	0.156	0.143	0.080	0.133	0.163		0.019	0.018	0.018	0.019	0.017	0.018
KY295307.1 Agonippe sp. WAM T109160	0.168	0.153	0.123	0.148	0.143	0.153	0.133	0.151	0.141	0.146	0.126	0.153	0.171		0.019	0.016	0.017	0.018	0.018
KY295327.1 Agonippe sp. WAM T132757	0.146	0.168	0.131	0.063	0.138	0.163	0.158	0.158	0.158	0.151	0.116	0.168	0.158	0.163		0.017	0.018	0.017	0.018
KY295328.1 Agonippe sp. WAM T132738	0.163	0.131	0.030	0.133	0.121	0.171	0.131	0.141	0.136	0.138	0.098	0.131	0.156	0.123	0.128		0.017	0.017	0.017
KY295333.1 Agonippe sp. SAM-SH52	0.148	0.146	0.136	0.146	0.156	0.166	0.141	0.163	0.146	0.171	0.121	0.146	0.181	0.136	0.153	0.138		0.017	0.019
KY295337.1 Agonippe cupulifex WAM-T133995	0.168	0.141	0.121	0.143	0.123	0.128	0.133	0.148	0.136	0.123	0.101	0.141	0.141	0.146	0.136	0.136	0.138		0.018
KY295349.1 Agonippe sp. WAM T129259	0.161	0.141	0.118	0.168	0.146	0.163	0.161	0.148	0.161	0.146	0.128	0.141	0.148	0.161	0.158	0.131	0.168	0.143	

Table 5. Genetic p-distance (below) and the associated standard error (above – blue text) between all *Idiosomma* mygalomorph (Idiopidae) haplotypes shown in Figure 2. New Morning *Idiosoma* specimens, and associated genetic distances, shaded in pink, as per colour-coding in Figure 2. Specimens identified with '*' are those representing shared haplotypes. Un-corrected p-distances do not account for mutational saturation, which results from back mutations, and therefore provide a conservative estimate of genetic distance.

	NX04*	**NX07**	**IAJ I21 I1**	**IAW I22 T96627**	**MH144664.1 WAM T96623 MYG064**
NX04*		0.003	0.005	0.014	0.008
NX07	0.003		0.004	0.014	0.007
IAJ I21 I1	0.008	0.005		0.015	0.008
IAW I22 T96627	0.086	0.083	0.088		0.013
MH144664.1WAM T96623 MYG064	0.024	0.021	0.027	0.072	

Table 6. Genetic p-distance (below) and the associated standard error (above – blue text) between all nemesiid mygalomorph haplotypes shown in Figure 3. New Morning *Chenistonia* specimens, and associated genetic distances, shaded in green, as per colour-coding in Figure 3. Un-corrected p-distances do not account for mutational saturation, which results from back mutations, and therefore provide a conservative estimate of genetic distance.

	NX12	**NCF N68 I14**	**NDI N73 O328**	**NDJ N71 O331**	**NDN N80 O336**	**NGJ N130 CZ33**	**MG800156 1 MYG469 WAMT9476 5**	**MG800158 1 MYG468 WAMT9606 0**
NX12		0.009	0.019	0.019	0.019	0.018	0.016	0.018
NCF N68 I14	0.038		0.019	0.019	0.020	0.018	0.016	0.018
NDI N73 O328	0.185	0.188		0.019	0.021	0.019	0.018	0.019
NDJ N71 O331	0.185	0.180	0.183		0.020	0.019	0.019	0.017
NDN N80 O336	0.185	0.197	0.233	0.207		0.018	0.020	0.018
NGJ N130 CZ33	0.159	0.156	0.190	0.188	0.163		0.018	0.018
MG800156 1 MYG469 WAMT94765	0.120	0.125	0.163	0.180	0.200	0.154		0.017
MG800158 1 MYG468 WAMT96060	0.151	0.156	0.180	0.144	0.168	0.168	0.147	

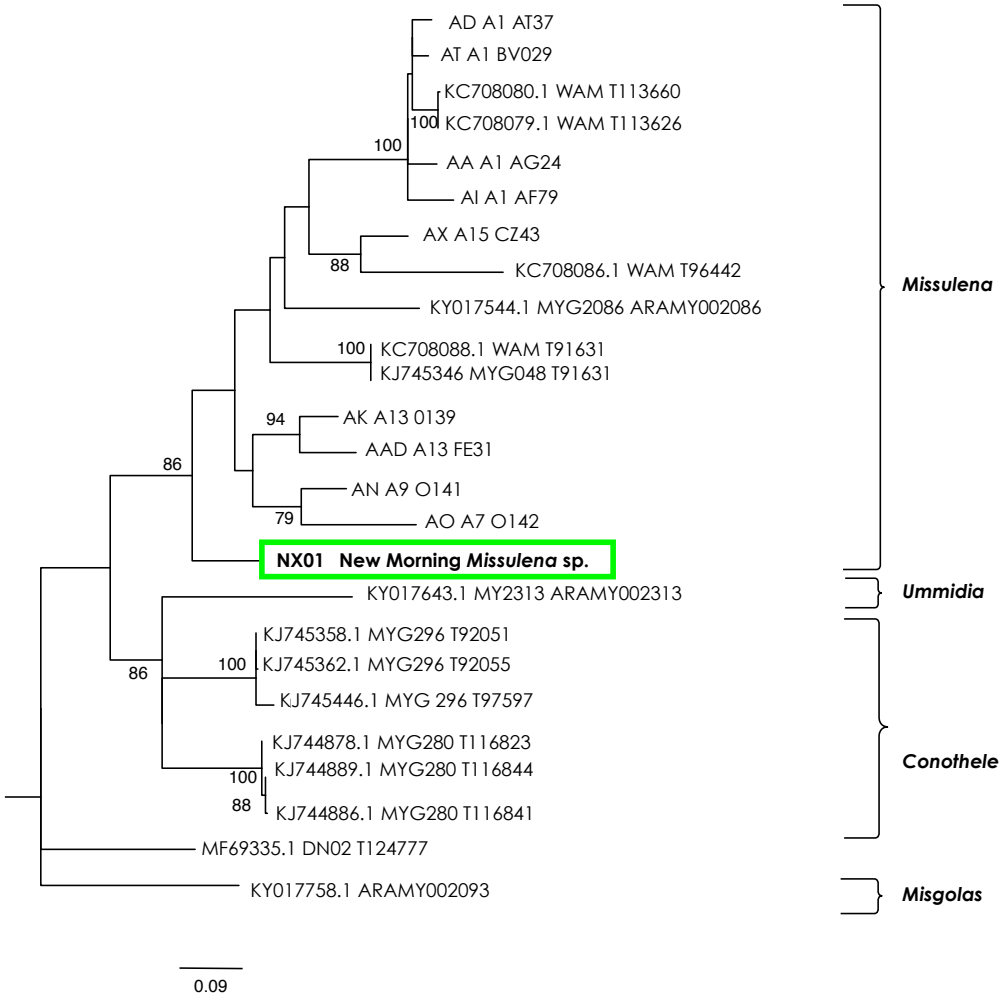

Figure 1. Maximum likelihood analysis of Actinopid *COI* mtDNA sequences, showing the placement of the New Morning mygalomorph specimen (outlined in green) within the current taxonomic framework of the family Actinopodidae. Numbers on nodes indicate nodal support by means of maximum likelihood (ML) bootstrap values. Bootstrap values <60 are not shown. Scale indicates inferred evolutionary distance (substitutions/site).

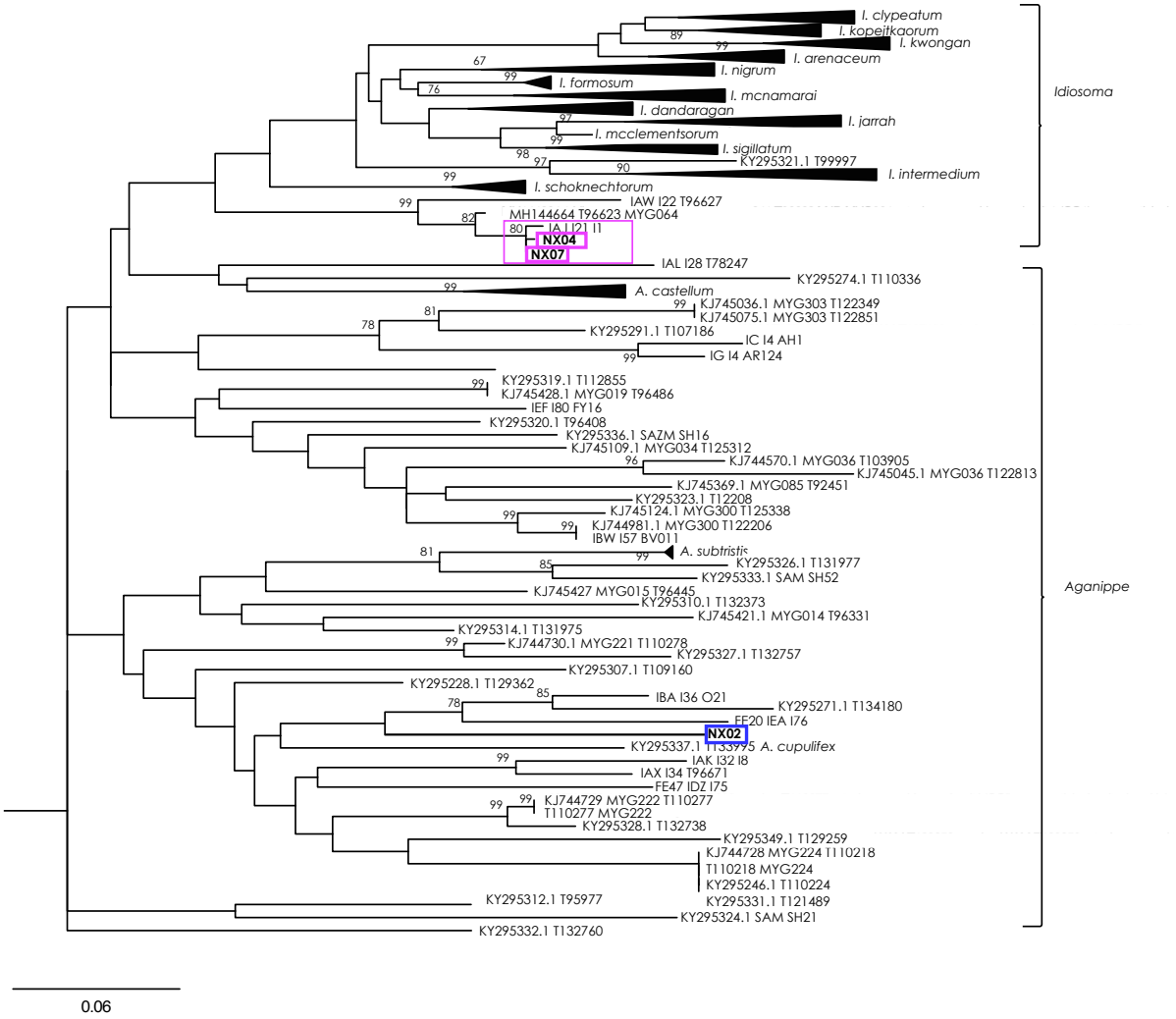

Figure 2. Maximum likelihood analysis of Idiopid *COI* mtDNA sequences, showing the placement of the New Morning mygalomorph specimens (outlined in pink and blue) within the current taxonomic framework of the family Idiopidae. The outer pink box highlights the lineage/species to which the NX04 & NX07 haplotypes belong. Numbers on nodes indicate nodal support by means of maximum likelihood (ML) bootstrap values. Terminal nodes are collapsed for species. Bootstrap values <60 are not shown. Scale indicates inferred evolutionary distance (substitutions/site).

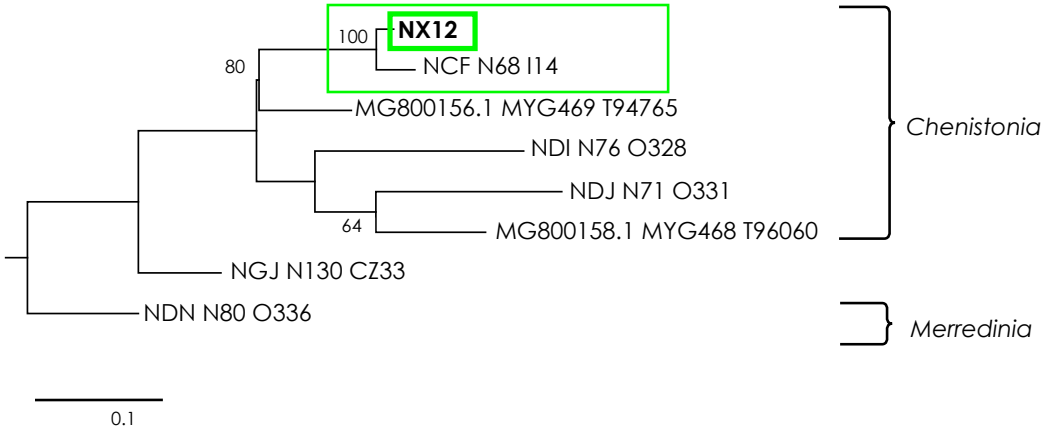

Figure 3. Maximum likelihood analysis of Nemesiid *COI* mtDNA sequences, showing the placement of the New Morning mygalomorph specimen (outlined in green) within the current taxonomic framework of the family Nemesiidae. The outer green box outline indicates the species to which the New Morning nemesiid specimen belongs. Numbers on nodes indicate nodal support by means of maximum likelihood (ML) bootstrap values. Bootstrap values <60 are not shown. Scale indicates inferred evolutionary distance (substitutions/site).

Appendix 1. Mygalomorph spider specimens used during analysis in the present study, and the genetic lineage to which they belong. New morning specimens shaded in grey.

Helix ID	GenBank ID	Field ID	Museum Reg No	Molecular Family	Molecular Species	Location
NX01		M20180905NMSRE11-01		Actinopodidae	A16	New Morning-Forrestania
AT37		M20110729.JML16-02	119995	Actinopodidae	A1	Jinidi to Mainline
BV029		M20120223.KDW28A-05		Actinopodidae	A1	Koodaideri Western Corridor
AG24		M20110416.SP07-11	113591	Actinopodidae	A1	South parmelia
AF79		M20110507.HIB16-03		Actinopodidae	A1	
CZ43		M20120627.RIC16-03		Actinopodidae	A15	Mt Richardson
O139		NoData	45845	Actinopodidae	A13	Exclamation Lake, site SG 12
FE131						
O141			44144	Actinopodidae	A9	Beeliar Heights
O142			46055	Actinopodidae	A7	Ferguson Valley, Henty Brook Road
			113660	Actinopodidae		
			113626	Actinopodidae		
			96442	Actinopodidae		
			91631	Actinopodidae		
			91631	Actinopodidae		
			92051	Actinopodidae		
			92055	Actinopodidae		
			97597	Actinopodidae		
			116823	Actinopodidae		
			116844	Actinopodidae		
			116841	Actinopodidae		
			124777	Actinopodidae		
				Actinopodidae		
				Actinopodidae		
				Actinopodidae		
NX04		M20180831NMM06-01		Idiopidae	I21	New Morning - Forrestania
NX07		M20180904NMSRE05-03		Idiopidae	I21	New Morning - Forrestania
NX02		M20180828NMSRE01-01		Idiopidae	I67	New Morning - Forrestania
IAT_I35_T77637			77637	Idiopidae		
FE20_IEA_I76				Idiopidae		
FE47_IDZ_I75				Idiopidae		
IAJ_I21_I1				Idiopidae		
IAK_I32_I8				Idiopidae		
IAL_I28_T78247			78247	Idiopidae		
IAM_I27_T93853			93853	Idiopidae		
IAN_I24_T96270			96270	Idiopidae		
IAQ_I25_T97336			97336	Idiopidae		
IAW_I22_T96627			96627	Idiopidae		
IAX_I34_T96671			96671	Idiopidae		
IBA_I36_O21				Idiopidae		
IBB_I17_O3				Idiopidae		
IBD_I17_O4				Idiopidae		
IBI_I54_AA8				Idiopidae		
IBW_I57_BV011				Idiopidae		
IC_I4_AH1				Idiopidae		
ICI_I15_AA15				Idiopidae		
ICJ_I15_AA9				Idiopidae		
ICK_I15_AA6				Idiopidae		
ICL_I15_AA10				Idiopidae		
ICM_I15_AA12				Idiopidae		
ICN_I15_AA13				Idiopidae		
ICO_I15_AA14				Idiopidae		
ICP_I15_AA11				Idiopidae		
ICQ_I15_AA34				Idiopidae		
ICR_I15_O54				Idiopidae		
IEF_I80_FY16				Idiopidae		
IG_I4_AR124				Idiopidae		
IS_I15_AA24				Idiopidae		
	KJ744570.1		103905	Idiopidae		
	KJ744728.1		110218	Idiopidae	MYG306	
	KJ744729.1		110277	Idiopidae	MYG224	
	KJ744730.1		110278	Idiopidae	MYG222	
	KJ744981.1		122206	Idiopidae	MYG221	
				Idiopidae	MYG300	
				Idiopidae		
				Idiopidae		
			110218	Idiopidae		
			110277	Idiopidae	MYG224	
			96486	Idiopidae	MYG222	
	KJ745036.1		122349	Idiopidae	MYG019	
	KJ745045.1		122813	Idiopidae	MYG303	

Helix ID	GenBank ID	Field ID	Museum Reg No	Molecular Family	Molecular Species	Location
	KJ745075.1		122851	Idiopidae	MYG306	
	KJ745098.1		123102	Idiopidae	MYG303	
	KJ745109.1		125312	Idiopidae		
	KJ745124.1		125338	Idiopidae	MYG304	
	KJ745369.1		92451	Idiopidae	MYG300	
	KJ745421.1		96331	Idiopidae	MYG085	
	KJ745427.1		96445	Idiopidae	MYG014	
	KJ745428.1		96486	Idiopidae	MYG015	
	KY295228.1		129362	Idiopidae	MYG019	
	KY295238.1		132564	Idiopidae		
	KY295246.1		110224	Idiopidae		
	KY295247.1		97339	Idiopidae		
	KY295262.1		99749	Idiopidae		
	KY295271.1		134180	Idiopidae		
	KY295274.1		110336	Idiopidae		
	KY295282.1		SH15	Idiopidae		
	KY295291.1		107186	Idiopidae		
	KY295292.1		131632	Idiopidae		
	KY295307.1		109160	Idiopidae		
	KY295310.1		132373	Idiopidae		
	KY295312.1		95977	Idiopidae		
	KY295314.1		131975	Idiopidae		
	KY295315.1		78246	Idiopidae		
	KY295316.1		110576	Idiopidae		
	KY295317.1		132737	Idiopidae		
	KY295319.1		112855	Idiopidae		
	KY295320.1		96408	Idiopidae		
	KY295321.1		99997	Idiopidae		
	KY295323.1		122088	Idiopidae		
	KY295324.1		SH21	Idiopidae		
	KY295326.1		131977	Idiopidae		
	KY295327.1		132757	Idiopidae		
	KY295328.1		132738	Idiopidae		
	KY295331.1		121489	Idiopidae		
	KY295332.1		132760	Idiopidae		
	KY295333.1		SH52	Idiopidae		
	KY295334.1		SH81	Idiopidae		
	KY295336.1		SH16	Idiopidae		
	KY295337.1		133995	Idiopidae		
	KY295349.1		129259	Idiopidae		
	MH144610.1		139519	Idiopidae	MYG475	Warrachuppin
	MH144611.1		92079	Idiopidae	MYG475	Manning
	MH144612.1		140940	Idiopidae	MYG475	Bullfinch
	MH144613.1		139517	Idiopidae	MYG475	Mungarri
	MH144614.1		99952	Idiopidae	MYG156	Boddington
	MH144615.1		124143	Idiopidae	MYG156	Lesmurdie
	MH144616.1		40601	Idiopidae	MYG156	Mt Helena
	MH144617.1		40632	Idiopidae	MYG156	Stoneville
	MH144618.1		136943	Idiopidae	MYG156	Bullsbrook
	MH144619.1		55925	Idiopidae		Curtin
	MH144620.1		129191	Idiopidae		Karnup
	MH144621.1		46054	Idiopidae		Dalyellup
	MH144622.1		123102	Idiopidae		Leschenault
	MH144623.1		132756	Idiopidae		Shenton Park
	MH144624.1		139469	Idiopidae	MYG474	Julimar
	MH144625.1		139832	Idiopidae	MYG474	7 Mile Well
	MH144626.1		127017	Idiopidae	MYG477	New Norcia
	MH144627.1		108031	Idiopidae	MYG477	Watheroo
	MH144628.1		125751	Idiopidae	MYG262	Mummaloo
	MH144630.1		139470	Idiopidae	MYG262	Mt Gibson
	MH144631.1		139518	Idiopidae	MYG520	Bruce Rock
	MH144632.1		139496	Idiopidae	MYG520	Cleary
	MH144633.1		26107	Idiopidae	MYG520	Trayning
	MH144634.1		122017	Idiopidae		
	MH144635.1		122018	Idiopidae		Wongan Hills
	MH144636.1		122019	Idiopidae		Wongan Hills
	MH144637.1		127020	Idiopidae		Wongan Hills
	MH144638.1		133465	Idiopidae	MYG518	Meenaar
	MH144639.1		140765	Idiopidae	MYG518	York
	MH144640.1		96452	Idiopidae	MYG018	Albion
	MH144641.1		110581	Idiopidae	MYG018	Yakabindie
	MH144642.1		103475	Idiopidae	MYG018	Yeelirrie
	MH144643.1		101942	Idiopidae	MYG018	Yeelirrie
	MH144644.1		78252	Idiopidae	MYG018	Coolcalalaya
	MH144645.1		108032	Idiopidae	MYG018	Woolgorong
	MH144646.1		107368	Idiopidae	MYG018	Glen STn
	MH144647.1		136250	Idiopidae	MYG018	Boolardy Stn
	MH144648.1		136252	Idiopidae	MYG018	Jack Hills
	MH144649.1		108030	Idiopidae	MYG018	Lakeside stn
	MH144650.1		108516	Idiopidae	MYG018	Karara
	MH144651.1		110279	Idiopidae	MYG018	Kadji
	MH144652.1		108517	Idiopidae	MYG018	Dalgaranga Stn
	MH144653.1		117996	Idiopidae	MYG018	Blue Hill
	MH144654.1		125765	Idiopidae	MYG521	Mummaloo

Helix ID	GenBank ID	Field ID	Museum Reg No	Molecular Family	Molecular Species	Location
	MH144655.1		140751	Idiopidae	MYG521	Charles Darwin
	MH144656.1		108519	Idiopidae	MYG521	Charles Darwin
	MH144657.1		126455	Idiopidae	MYG521	Mummaloo
	MH144658.1		108523	Idiopidae	MYG521	
	MH144659.1		108518	Idiopidae	MYG521	Bunitne
	MH144660.1		139468	Idiopidae	MYG472	Mt Leseur
	MH144661.1		27117	Idiopidae	MYG472	Eneabba
	MH144662.1		141118	Idiopidae	MYG478	Kalbarri
	MH144663.1		41364	Idiopidae	MYG478	Zuytdorp
	MH144664.1		96623	Idiopidae		
	MH144665.1		97337	Idiopidae		
	MH144666.1		96285	Idiopidae		
	MH144667.1		96288	Idiopidae		
NX12		M20180904NMM06-02		Nemesiidae	N68	New Morning - Forrestania
I14		M20091205SQH04TS-2		Nemesiidae	N68	Forestania
O328			78507	Nemesiidae	N73	Torndirrup National Park
CZ33		M20120626.RIC14-01		Nemesiidae	N130	Mt Richardson
O336			78515	Nemesiidae	N80	Mt Groper, ridge, site 3
			94765	Nemesiidae		
			96060	Nemesiidae		

Appendix 2. Mean within species p-distances for the fourteen described species of Idiopid mygalomorph spiders (see figure 2). Minimum and maximum ranges indicated in parentheses.

Species	Mean p-distance (min-max)
A. castellum	**0.056936937** (0.008 - 0.081)
I. sigillatum	**0.042471042** (0.000 – 0.065)
I. dandargan	**0.057657658** (0.000 - 0.086)
I. clypeatum	**0.053621154** (0.000 - 0.089)
I. kopejtkaorum	**0.036636637** (0.000 – 0.059)
I. intermedium	**0.063513514** (0.019 - 0.080)
I. jarrah	**0.044594595** (0.000 – 0.065)
I. mcclementsorum	**0.040540541**
I. formosum	**0.013513514**
I. mcnamarai	**0.073873874** (0.065 – 0.081)
I. nigrum	**0.038288288** (0.008 – 0.051)
I. schoknechtorum	**0.032432432**
I. kwongan	**0.051351351**
I. aranaceum	**0.062162162**

Appendix 3. Mean between group p-distances for the fourteen described species of Idiopid mygalomorph spiders (see figure 2). The single *Aganippe* species is shaded in grey – remaining species all belong to the genus *Idiosoma*.

	Aganippe	***Idiosoma***												
	A. castellum	***I. sigillatum***	***I. dandargan***	***I. clypeatum***	***I. kopejtkaorum***	***I. intermedium***	***I. jarrah***	***I. mcclementsorum***	***I. formosum***	***I. mcnamarai***	***I. nigrum***	***I. schoknechtorum***	***I. kwongan***	***I. aranaceum***
A. castellum														
I. sigillatum	0.157													
I. dandargan	0.151	0.094												
I. clypeatum	0.149	0.115	0.102											
I. kopejtkaorum	0.142	0.119	0.111	0.069										
I. intermedium	**0.163**	0.135	0.141	0.139	0.145									
I. jarrah	0.161	0.102	0.114	0.128	0.126	0.141								
I. mcclementsorum	0.161	0.090	0.103	0.118	0.121	0.138	0.096							
I. formosum	0.147	0.084	0.092	0.099	0.106	0.129	0.116	0.107						
I. mcnamarai	0.149	0.109	0.109	0.118	0.118	0.130	0.118	0.116	0.086					
I. nigrum	**0.139**	0.097	0.108	0.118	0.121	0.129	0.120	0.096	0.089	0.095				
I. schoknechtorum	0.144	0.122	0.103	0.116	0.124	0.143	0.128	0.130	0.104	0.110	0.097			
I. kwongan	0.153	0.108	0.114	0.082	0.084	**0.148**	0.136	0.117	0.100	0.123	0.113	0.126		
I. aranaceum	0.141	0.107	0.110	**0.080**	0.077	0.138	0.121	0.109	0.103	0.111	0.114	0.136	0.089	